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Ecology of the Terrestrial Vertebrate Fauna of the Huron Islands, Lake Superior

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THE ECOLOGY OF THE TERRESTRIAL VERTEBRATE FAUNA OF THE HURON ISLANDS, LAKE SUPERIOR

BY

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The Huron Islands in winter, from the mainland about 4 miles to the southeast. Visible from left to right are Cattle Island, Huron Island, East Huron Island, and Gull Rock.

ABSTRACT

A study was conducted on the Huron Islands in Lake Superior to determine what terrestrial vertebrate species are present, what habitats they occupy, and what faunal and ecological differences exist between the islands and the nearby mainland. Results were obtained by observation and by live-trapping on the two main islands, Huron Island and East Huron Island.

Four species of amphibians, 2 reptiles, 64 birds, and 5 mammals were observed on the islands. There were records and evidence of 3 additional mammal and 11 bird species. Except for birds these represent less than 20 percent of the species found on the adjacent mainland.

The majority of the amphibians and reptiles probably reached the islands by swimming, and most of the mammals probably arrived by crossing the ice during the winter. No true hibernating mammals were found on the islands. Rafting is a possible secondary means of arrival. Human activity may have accounted for the arrivals of two of the mouse species found on the islands.

Population densities of the three species of mice (Mi- (Microtus pennsylvanicus, Peromyscus maniculatus, and Cleth- rionomys gapperi) were found to be higher than those on the nearby mainland. A low predation rate was felt to be the main reason for this. M. pennsylvanicus was found in more wooded areas on the islands than it normally occupies on the mainland. There was some evidence that C. gapperi, and, to a lesser extent, P. maniculatus, restricted Microtus from wooded areas on the islands.

ACKNOWLEDGEMENTS

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

The terrestrial vertebrate fauna of islands often varies considerably from that of adjacent mainland areas. Reasons for this may include the distance of the island from other land masses, the dispersal characteristics of the animal species involved, and the habitat found on the island.

The earliest island studies were conducted in oceanic areas, with evolution, adaptive radiation, and zoogeography the focus of much of the work (Wallace, 1895; Darwin, 1909; Darlington, 1957; Carlquist, 1965). Recently, extensive research has been carried out on smaller islands along sea coasts and in inland lakes. Many of these investigations have dealt with the problem of dispersal to and between islands (Jackson, 1919; Hatt, et al., 1948; Beer, Lukens, and Olson, 1954; Werner, 1956; Crowell, 1973).

Most of the lakes in the north central United States, including the Great Lakes, were formed during the Ice Ages which ended about 10,000 years ago (Hough, 1958). As the glaciers receded, the depressions they left were filled with water by the melting ice sheet. Higher elevations of scoured bedrock emerged as land masses and islands. Thus populations on islands in glacial lakes are made up of immigrants which reached the islands after their formation. Only in the instance of manmade lakes are there relict populations, comprised of animals resident on their islands when they became isolated.

The habits of a particular species of animal are important in immigration. Many reptiles and amphibians are

associated with water, and are able to swim several miles (Hatt, et al., 1948). Among mammals, small ones such as shrews and mice are less able to swim great distances than are larger ones such as moose (Alces alces), which have swum as far as 24.5 km (15 miles) (Mech, 1966). Even among closely related species it has been found that some are better at crossing water barriers than others (Werner, 1956; Cameron, 1964; Grant, 1970a; Crowell, 1973).

Jackson (1919) first suggested that winter habits of many species in temperate regions may have a bearing on which ones will reach islands, because of the possibility of travel on ice. He found that the mammals on the Apostle Islands in western Lake Superior included only species which are active during the winter and were often seen crossing the ice. Mammals which are inactive in the winter were found on the nearby mainland but not on the islands. This theory has been supported in later studies in Basswood Lake in Minnesota and in the Thousand Islands region in New York (Beer, et al., 1954; Werner, 1956).

Rafting, being inadvertently transported on drifting debris or ice, probably accounts for much of the immigration to islands by small animals (Hatt, et al., 1948), especially mice and other vertebrates which are sometimes found on beach areas but are not very likely to venture into the water to swim (Crowell, 1973).

Man may also be a factor in the movement of vertebrates to islands (Hatt, et al., 1948; Ozoga and Phillips, 1964),

but many workers feel that this type of transport is not common (Beer, et al., 1954; Crowell, 1973).

Flying animals, such as most birds and bats, have little problem reaching islands, but for many reptiles, amphibians, and mammals broad expanses of water obstruct movement. Partly because of this, there are usually fewer vertebrate species on an island than on the nearby mainland (Hatt, et al., 1948; Beer, et al., 1954; Johnsson and Shelton, 1965; Webb, 1965). McPherson and Krull (1972), who studied relict mammal populations on islands in manmade Crab Orchard Lake in Illinois, found a direct relationship between island size and the number of species present. Hatt (1948) theorized that mammals need a large enough area so that there will be sufficient numbers during low points in a population fluctuation to maintain the species on the island. Individuals of species which undergo such fluctuations may occur on a small island from time to time without being able to establish a population. In addition, small islands usually have fairly uniform habitats, which tend to limit faunal diversity (Hatt, et al., 1948; Manville, 1951).

The distance to nearby land masses is another factor in determining island colonization. An island near the shore is more accessible to animals which may swim, cross over ice, or be rafted to the island by drifting debris. Typical immigration patterns result in the number of species decreasing with increasing distance from the mainland (Darlington, 1957).

Most dispersal to islands is probably accidental, so

vertebrates may reach islands where the habitat is different from that of their normal area. In the case of a bird or a bat it is possible to leave, but others must adapt to the available habitat or they will not survive. For example, many investigators have found that the meadow vole (Microtus pennsylvanicus) often utilizes forests on islands, rather than its normal open habitat (Manville, 1951; Werner, 1956; Cameron, 1964; Webb, 1965). This may be partly due to lack of competition from other species (Cameron, 1964), but it also indicates adaptability which may contribute to the meadow vole's ability to populate islands (Crowell, 1973). The limitations of area and habitat diversity on islands may intensify competition and interspecific interaction. Grant (1970b), in laboratory studies on competition among rodents, found that some species are able to restrict habitat use by the less competitive species. This has relevance to habitat use on islands, where the competing species may be absent, allowing the other species to invade habitat where it would not ordinarily be found. Many workers have related competition among mice to their relative success on islands (Cameron, 1964; Webb, 1965; Crowell, 1973).

Many of the larger islands and archipelagos in the upper Great Lakes have been observed and studied fairly extensively. Hatt et al. (1948) surveyed the Beaver Island group in eastern Lake Michigan, and Ozoga and Phillips (1964) studied the mammals of Beaver Island. Manville (1951) investigated the fauna of several islands in upper Lake Huron, including Little

Rogg Island. A few Lake Superior islands have been the subject of numerous studies. Jackson (1919) made an early survey of mammals on the Apostle Islands, Wisconsin. During 1973 and 1974 Stockton Island in the Apostle group was surveyed for an Environmental Impact Statement because of the possibility of development of a campground on the island (Stadnyk, Verch, and Goetz, 1974). Isle Royale has been a National Park since 1940 (Mech, 1966), and there are detailed records of its vertebrate populations (Johnsson and Shelton, 1965).

Records on the fauna of the Huron Islands are scarce. Shiras (1935) noted that the islands were "white with gulls" when he passed them in about 1870 on his way to the Huron River. There are records of the double-crested cormorant (Phalacrocorax auritus) and the peregrine falcon (Falco peregrinus), both now very rare in the area, nesting on the islands in the 1930's and 1940's (Manville, 1942). The Huron Mountain Club, a private organization occupying adjacent mainland, has records of some bird sightings on and near the Huron Islands (Rice, 1973).

Herring gulls (Larus argentatus) on the islands were banded by Richard E. Manville in the 1940's and Nicholas J. Ilnicky during the early 1960's. Ilnicky (unpub. ms.) has compiled recovery records of gulls banded on the islands, and has recorded observations on other species of birds.

Seney National Wildlife Refuge personnel made a three-day trip to the islands in June, 1969, and another during August, 1972 (Lennartson, 1972). They recorded some general

observations on plant, mammal, and bird populations on the islands.

There have been several studies of the vertebrate fauna on the mainland area adjacent to the Huron Islands. Manville (1942, 1949) surveyed the vertebrates of the Huron Mountains and carried out a detailed study of small mammals of the area. Laundre (1975) surveyed the mammals of the area again in 1972 and 1973 to determine what changes had occurred during the past few decades. Records of birds observed in the Huron Mountain area have been compiled by Rice (1973). About 29 km (18 miles) to the south of the Huron Islands, the birds, mammals, amphibians, and reptiles of the McCormick Experimental Forest have been surveyed by Robinson (1973, 1975) and Werner (1973, 1975). These studies of the mainland fauna can be used to provide a basis of comparison between the islands and the mainland.

The Huron Islands are located about 5 km (3 miles) from the southern shore of Lake Superior, and are relatively isolated and undisturbed. Although they have been part of the National Wildlife Refuge system since 1905 (Shiras, 1935), little is known of their vertebrate fauna. This research was initiated to determine what species are present on the Huron Islands, the habitats they occupy, and how they interact. The findings were compared with published results of research on the adjacent mainland areas and on other islands in the Great Lakes region and elsewhere, to test whether hypotheses on island colonization and habitation are borne out by the fauna of the Huron Islands.

THE STUDY AREA

The Huron Islands are located in Lake Superior 4.9 to 5.7 km (3 to 3.5 miles) from its southern shore, at the western edge of Marquette County, Michigan (Figure 1). There are four main vegetated islands, East Huron, Huron, Cattle, and Gull Rock, and numerous small, barren, rocky islands, totalling 59.5 hectares (147 acres). They are composed of pink and gray granite upthrusts (Bureau of Sport Fisheries and Wildlife leaflet, no date) left after glacial scouring formed the present Lake Superior approximately 10,000 years ago. Many of the granite surfaces show striations as evidence of their glacial history.

No data are available on climatic parameters from the islands, but the climate is cool in summer and cold in winter, with considerable snowfall, as evidenced by signs of hare browsing 6 feet above the ground.

Because of the proximity of the islands to shipping routes a lighthouse (Figure 2) was built at the highest elevation of Huron Island, about 30 m (100 ft) above Lake Superior, in 1868. It began operation in 1877. A brick building on the northwest end of the island was constructed in the early 1900's, with an addition built in 1930. A wooden residence building near the lighthouse was built in 1934. In the early 1950's the Coast Guard assumed operation of the light station from the last civilian keeper of the Lighthouse Service. In 1962 and 1963 they built a concrete block building on the northwestern end of the island as

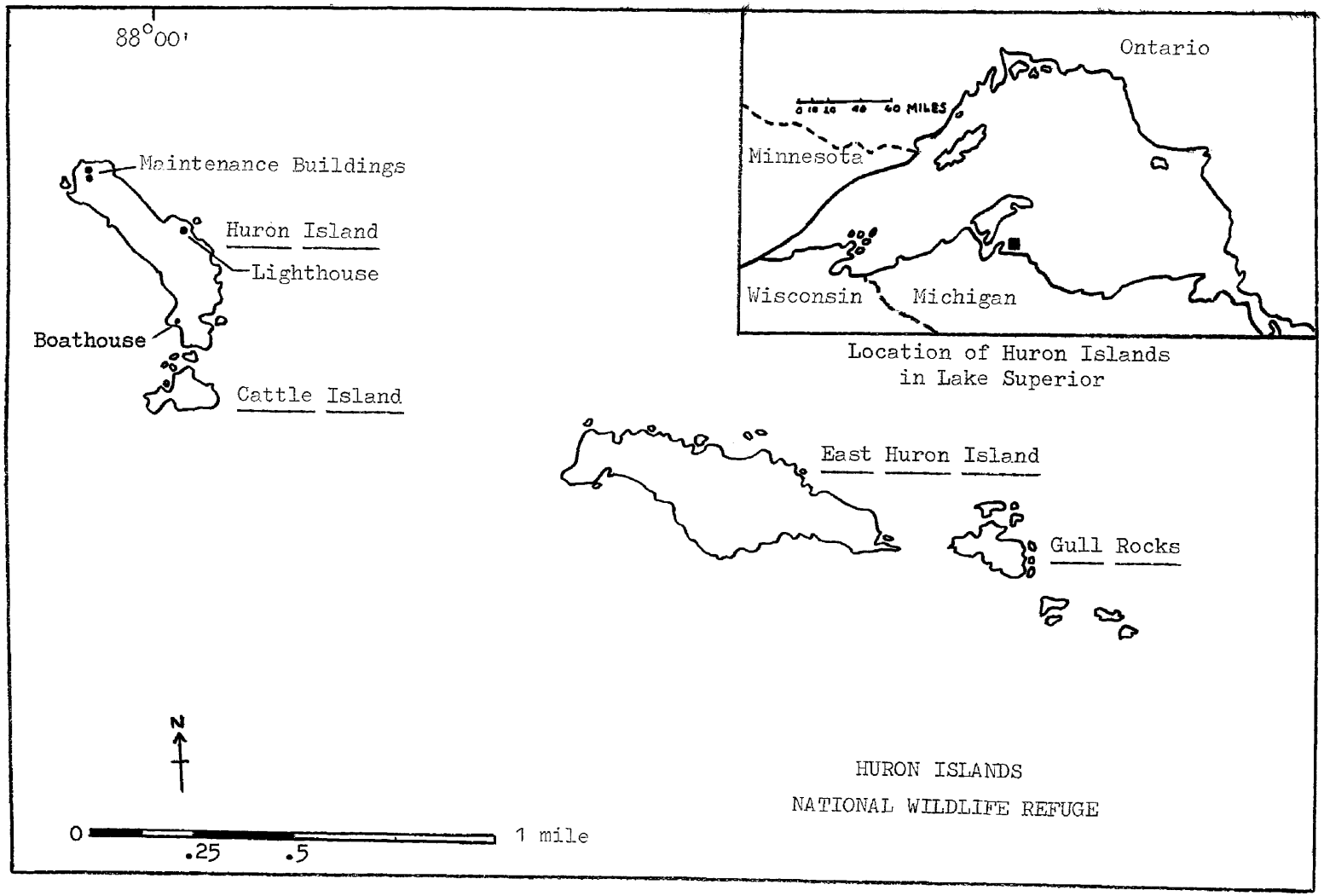
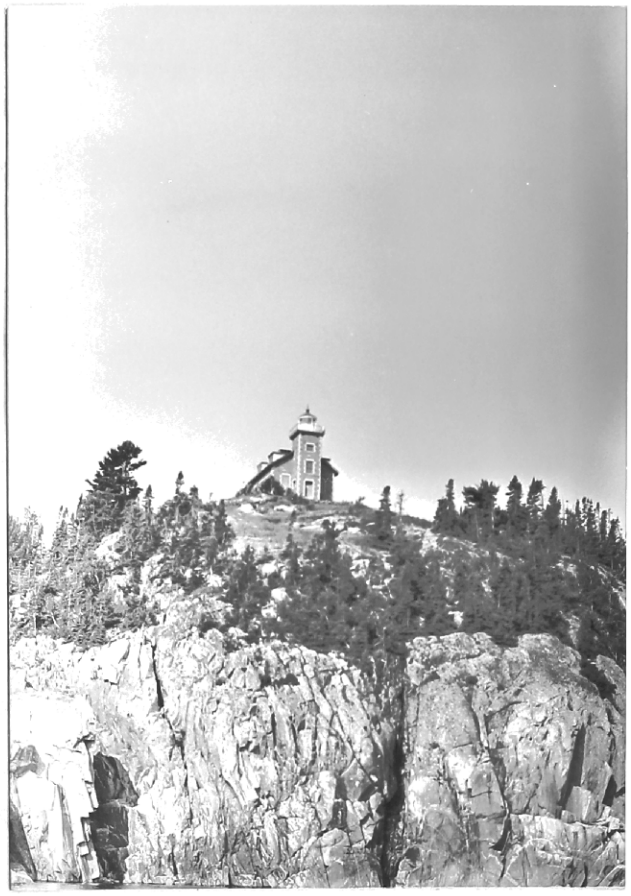


Figure 1. The Huron Islands, Lake Superior, showing locations of buildings on Huron Island.



R.P. Smith

Figure 2. Lighthouse on Huron Island, built in 1868.

living quarters for the crew which manned the station during the shipping season (Lennartson, 1972). The Coast Guard vacated the station in December, 1972, when the light and foghorn were automated. Use of the light and horn were abandoned in 1975 (The Mining Journal, March 17, 1975).

The islands were designated as bird refuges by Theodore Roosevelt in 1905 (Shiras, 1935). They received full designation as a Wilderness Area in 1970 under the Wilderness Act of 1964 (Public Law 88-577, September 3, 1964) and the Omnibus Wilderness Act of January 2, 1970 (Public Law 91-504). The Huron Islands are now under the jurisdiction of the Bureau of Sport Fisheries and Wildlife, through the Seney National Wildlife Refuge with headquarters in Germfask, Michigan (Lennartson, 1972).

There are some vegetational and topographical differences between Huron and East Huron Islands, the two islands primarily involved in this study. The north and northeast shores of 16-hectare (40-acre) Huron Island are barren rock (Figure 3) with lichen growth only on the upper portions which are out of the reach of waves and ice. The southwestern side is less barren, with vegetation growing close to the edges of the cliffs which form the shoreline (Figure 4). The island is well vegetated along the ridge of the northern end and south of the lighthouse, with some variety of habitat types. The areas for about .4 hectare (1 acre) around the buildings on the northwestern end and about .2 hectare (.5 acre) around the lighthouse are open and grassy. There is

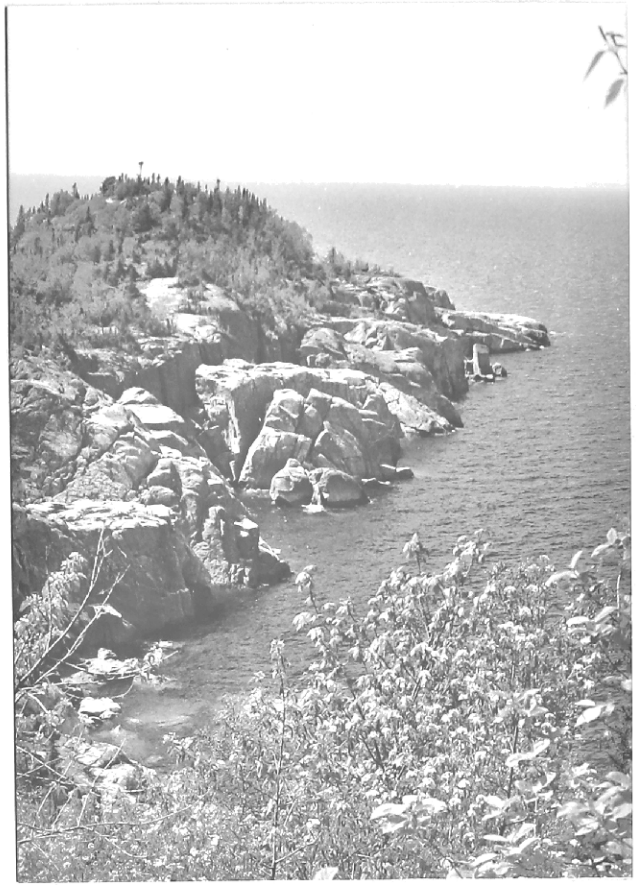


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Figure 3. Northeast shore of Huron Island, from lighthouse.

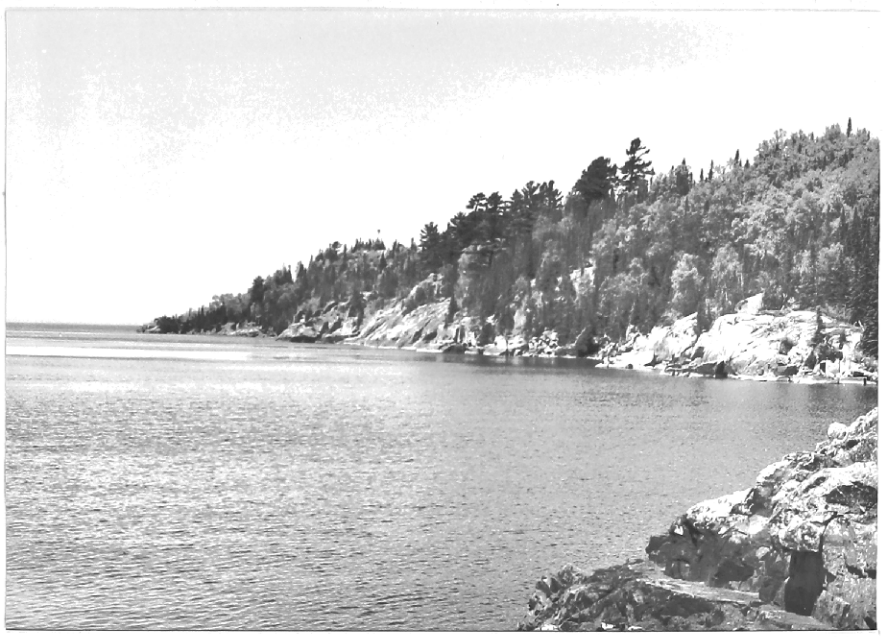

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Figure 4. Southwest shore of Huron Island.

a stand of about .4 hectare (1 acre) of large white pines (Pinus Strobus) near the shore west of the lighthouse. About 5.7 hectares (15 acres) of the southern end of the island is forested with balsam fir (Abies balsamea) with a groundcover mainly composed of reindeer lichen (Cladonia spp.). There are other smaller stands of balsam firs, some with the lichen groudcover, others with dense growths of American yew (Taxus canadensis). Along the ridge of the island there are areas of quaking aspen (Populus tremuloides), common chokecherry (Prunus virginiana), and red-osier dogwood (Cornus stolonifera).

The soil layer is probably not more than about 15 cm (6 inches) deep in most places, and the soil is normally very dry. The only exceptions are the grassy area immediately surrounding the concrete block building on the northwest end, which supports sphagnum under the grasses and sedges, and a swampy area about 120 m^2 (1250 ft^2) on the southern end of the island which contains standing water after heavy rains.

Besides the buildings previously mentioned, there is a boathouse at the southern end of the island. Approximately 1.6 km (1 mile) of footpaths connects the various buildings. this includes about 222 m (750 ft) of cement walkway, stairs, a 90-m (300-ft) tramway, and two bridges (Lennartson, 1972).

Thirty-one hectare (77 acre) East Huron Island varies slightly from Huron Island in topography and considerably in vegetation. The northern shore (Figure 5) is rocky and bare

G. Smith

Figure 5. North shore of East Huron Island from lighthouse on Huron Island.

G. Smith

Figure 6. South shore of East Huron Island, with the Huron Mountains on the mainland in the background.

C. Corin

Figure 7. Pond on north shore of East Huron Island.

along the immediate shoreline, but the whole northern side of the island is more sloping than that of Huron, and is able to retain more moisture. This has led to the presence of sphagnum 'bogs' in depressions along the north side of the island, with a predominance of black spruce (Picea mariana), a species which is not present on Huron Island. The topography of the southern shore is similar to that of Huron Island and is quite dry, with stands of red pines (Pinus resinosa), also a species not present on Huron Island (Figure 6). At the center, the island reaches a height of 48 m (161 ft) above lake level. Near the summit of this hill there are areas of quaking aspen and northern red oak (Quercus rubra borealis). There is thick shrub cover, especially American yew, over most of the island except the extreme eastern and western ends and the more open red pine areas along the shore. A gully runs for about .4 km (.25 mile) from south to north on the western half of the island, and is damp, with Michigan holly (Ilex verticillata) along portions of it. Surface water from the gully drains into a small pond, about 83 m^2 (300 ft^2) on the northern shore (Figure 7).

The extreme eastern end of the island, where the main part of the herring gull colony nests, is more barren, with a few red pines and deciduous shrubs.

There is evidence of past human use of East Huron Island. Near the western end of the island there is part of a wood frame building on its side, partly in the water, and there

is a small pile of bricks in a small grassy clearing. There are several old sawed tree stumps near the area as well. Due to the ruggedness of the remainder of the island, it is doubtful that human activity was very extensive.

Two of the smaller islands, Cattle and Gull Rock, are vegetated. Cattle Island, about 5 hectares (12 acres) in size, has a few red pines, white birches (Betula papyrifera), and some ground vegetation. Six-hectare (15-acre) Gull Rock has a few stunted red pines growing in crevices in the rocks. It is possible that some vertebrates besides herring gulls use these two islands, but they were not investigated during this study because of their small sizes and inaccessibility.

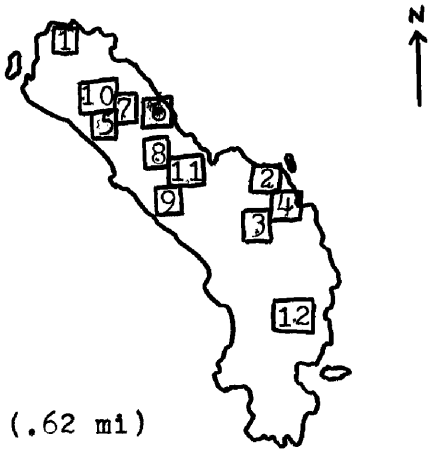
METHODS

The field work took place during June and July, 1974, with another short visit to Huron Island on 3 June 1975 to photograph trapping areas. A total of 16 days in 1974, 5-14 and 24-30 June, were spent on Huron Island, and five days, 11-16 July, on East Huron Island.

Amphibians and reptiles were searched for in all habitats by looking under logs, rocks, and in other likely spots. Note was made of species found and their habitats.

Birds were identified by sight and song. Any observed nesting activity was recorded, as were the habitats individuals were seen in. Each species' relative abundance was estimated based on observation during the study and on other records.

Mammal scats found were collected for later identification. Six No. 1 Havahart traps (squirrel size) were placed on Huron Island in an attempt to capture mammals larger than mice. Traps were set for three 3-day trapping periods, two on Huron Island and one on East Huron Island. No. 0 Havahart traps (mouse size), baited with a mixture of peanut butter, bacon fat, and rolled oats, were set in a variety of selected habitat types at intervals of 7.5 or 15 m (25 or 50 ft) (Figures 8 and 9). Mice captured were weighed, ear-tagged, and released at the trap site. Recapture data were used to estimate populations by the Lincoln and Schnabel methods (Overton, 1971). On Huron Island, the traps were set in the evening, then checked and reset in the



Scale: 7 cm = 1 km (.62 mi)

Figure 8. Locations of trapping plots on Huron Island.

1 Damp-grass-rock

2 Dry-grass-rock

3 Grassy

4 Grassy-shady

5 Grass-balsam fir

6 Open shrub-rock

7 Chokecherry shrub

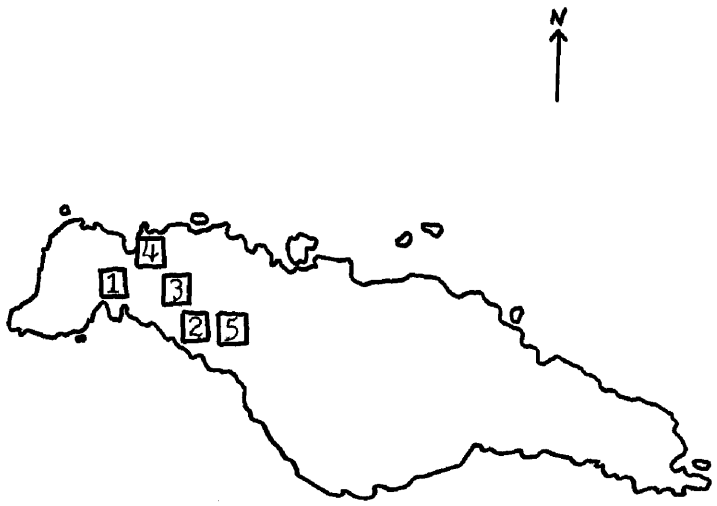
8 Red-osier dogwood

9 White pine

10 Balsam fir-yew

11 Balsam fir-lichen

12 Yew-balsam fir-swamp



Scale: 7 cm = 1 km (.62 mi)

Figure 9. Locations of trapping plots on East Huron Island.

1 Grass-shrub

2 Open shrub-rock

3 Balsam fir-no ground cover

4 Black spruce-balsam fir-rock

5 Yew-balsam fir-Michigan Holly

evening for the three subsequent days of the trapping period. On East Huron Island the traps were checked once a day, in the evening.

At each trap location all plants within a .9 m (3 ft) radius of the trap, and the closest tree within 3 m (10 ft) were recorded (Appendix A). Throughout the study as many of the plants on the islands were identified as was possible (Appendix B).

Trapping sites were chosen to represent as many habitat types as possible. Following are descriptions of the 12 plots on Huron Island and the 5 on East Huron Island.

Huron Island:

Plot 1. Damp grass-rock

This .4-hectare (1-acre) area was grassy, with rocky outcroppings and included two buildings and a raised tramway. The northeast end of the area (Figure 10) had damp spots, with sphagnum underlying the grasses and sedges. The rocky southwestern end (Figure 11) sloped to the southwest and had more varied herbaceous and woody growth. There were no trees within the .2-hectare (.5-acre) trapping plot.

Plot 2. Dry grass-rock

The trapping plot included 174 m^2 (1875 ft^2) of a .2-hectare (.5-acre) area near the lighthouse, and was predominantly grassy, with rocky outcroppings. The old wooden residence building was in the center of the plot (Figure 12). This was the highest point on the island and was well drained.

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Figure 10. Northeast end of damp grass-rock plot. Barracks building is on left.

G. Smith

Figure 11. Southwest end of damp grass-rock plot on Huron Island, with elevated tramway and walkway.

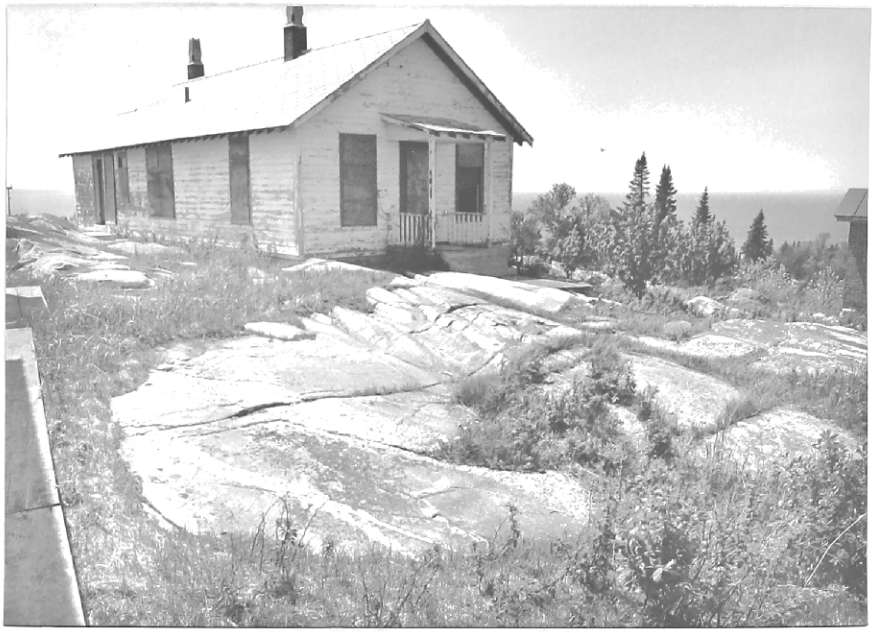

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Figure 12. Dry grass-rock plot on Huron Island, with old residence building at the center of the plot.

Plot 3. Grassy

This area, about 116 m^2 (1250 ft^2), was grassy, with similar herbaceous composition to that of plot 2, but it lacked rocky outcroppings (Figure 13). It was surrounded by deciduous trees and shrubs, primarily serviceberry (Amelanchier sp.) and chokecherry.

Plot 4. Grassy-shady

Grasses occurred on all portions of this 486 m^2 (4375 ft^2) site, and day-lilies (Hemerocallis fulva), heart-leaved asters (Aster cordifolius), and roses (Rosa sp.) were found on the north half of the area. The plot sloped towards the south, and the lower portion was well-shaded by aspens and balsam firs (Figure 14).

Plot 5. Grass-balsam fir

This 230 m^2 (2500 ft^2) opening was surrounded by balsam firs, and contained some red-osier dogwood, mountain maple (Acer spicatum), yew, and pin cherry (Prunus pensylvanica), as well as a thick cover of grasses (Figure 15).

Plot 6. Open shrub-rock

This site consisted of a 460 m^2 (5000 ft^2) flat rocky area surrounded by various types of trees. Ericaceous plants such as blueberry (Vaccinium angustifolium) and bearberry (Arctostaphylos Uva-ursi) were common at the edges of the rock. There were deciduous trees along the northeast side, and balsam firs and American yew along the southwest side of the outcropping (Figure 16).

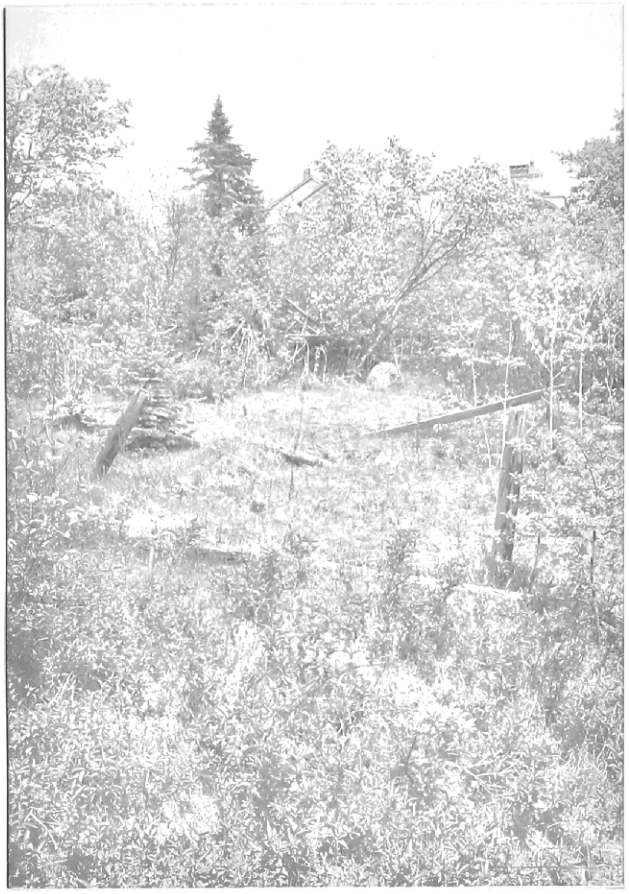

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Figure 13. Grassy plot on Huron Island, south of lighthouse.

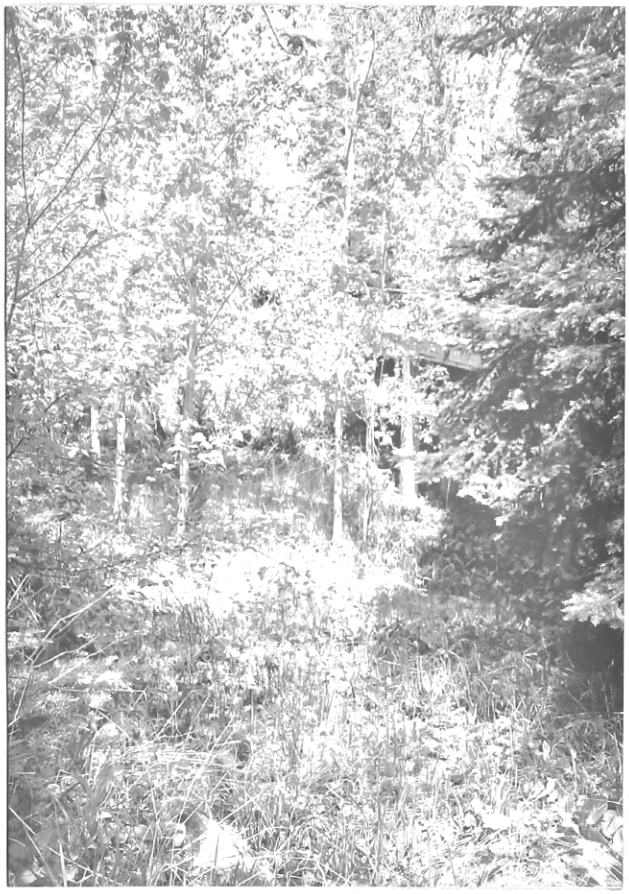

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Figure 14. Grassy-shady plot on Huron Island.

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Figure 15. Grass-balsam fir plot on Huron Island.

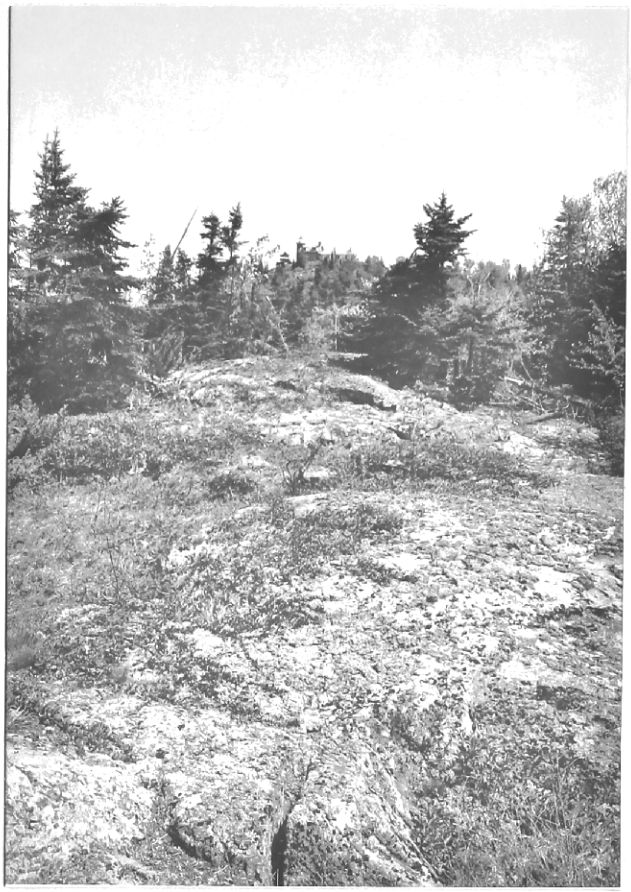

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Figure 16. Open shrub-rock plot on Huron Island.

Plot 7. Chokecherry shrub

A thick cover of chokecherry shrubs about .6 m (2 ft) tall covered about 80 percent of this 290 m^2 (3125 ft^2) area. There were numerous rocky outcroppings. The closest trees were quaking aspens, and there were aspen saplings interspersed with the chokecherries (Figure 17).

Plot 8. Red-osier dogwood

Red-osier dogwood was the most abundant shrub in this plot, with occasional balsam firs and yews. The ground was bare and dry in much of the area. The trapping plot included about 30 percent of the approximately 830 m^2 (9400 ft^2) area (Figure 18).

Plot 9. White pine

Located on the western side of the island, this site consisted of 345 m^2 (3750 ft^2) in a .4-hectare (1-acre) stand of large white pine trees. The ground was covered with needles, typical of pine forests. About half of the plot was exposed and rocky, with some small balsam firs (Figure 19).

Plot 10. Balsam fir-yew

Balsam firs with a dense ground cover of American yew were characteristic of this 345 m^2 (3750 ft^2) area. Bush honeysuckle (Diervilla Lonicera) was found near the trail which passed through the plot (Figure 20).

Plot 11. Balsam fir-lichen

This 290 m^2 (3125 ft^2) plot was made up of balsam firs, with a ground cover of reindeer lichen and scattered

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Figure 17. Chokecherry shrub plot on Huron Island.

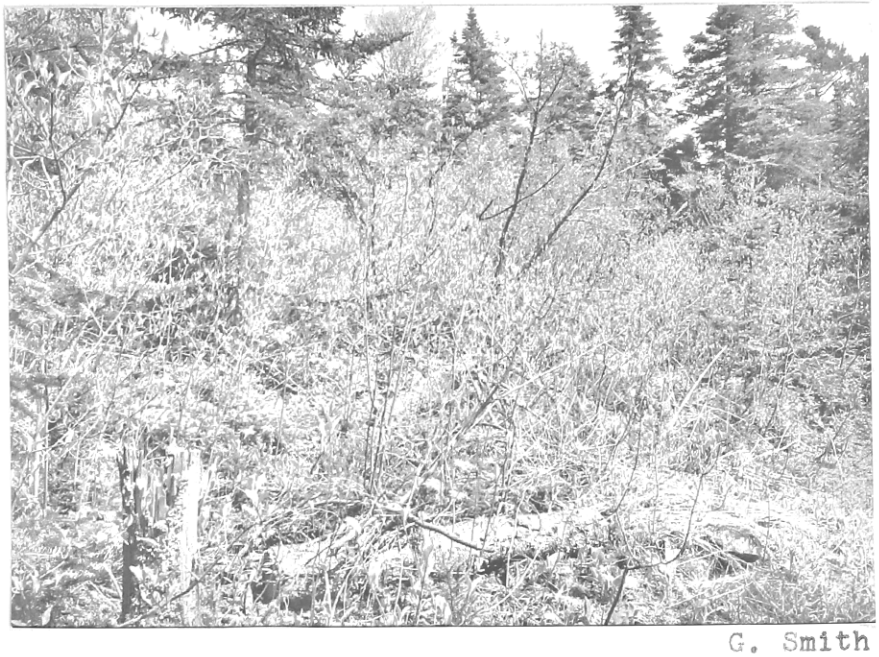

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Figure 18. Red-osier dogwood plot on Huron Island.

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Figure 19. White pine plot on Huron Island.

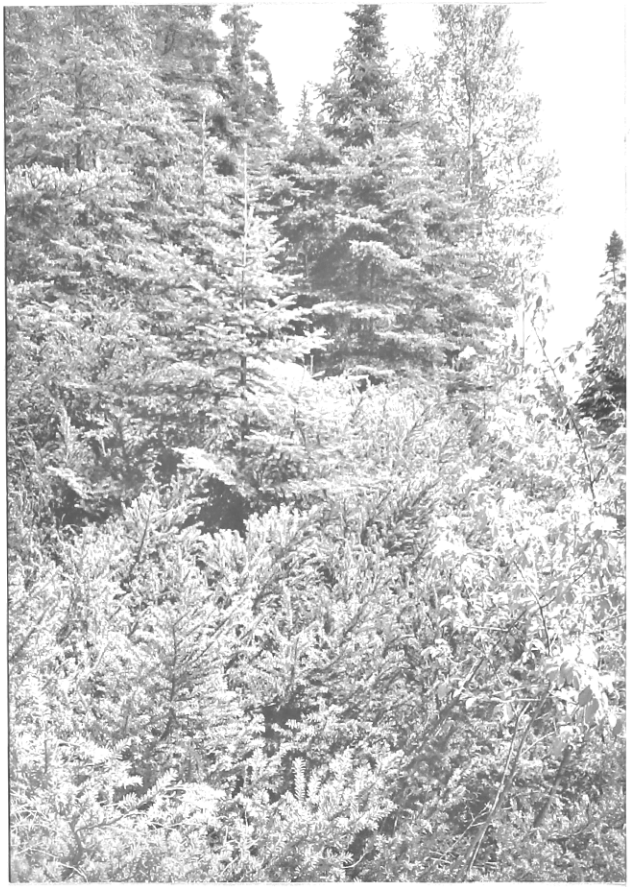

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Figure 20. Balsam fir-yew plot on Huron Island.

blueberry and bearberry (Figure 21). There were similar areas totalling around 4 hectares (10 acres) on the northwest and south ends of the island.

Plot 12. Yew-balsam fir-swamp

About half of this 730 m^2 (7500 ft^2) area had a ground cover of big-leaf aster (Aster macrophyllum) and thimbleberry (Rubus parviflora) (Figure 22). The remaining part was very wet, especially after a rain, when there were about 6 inches of standing water in a 58 m^2 (625 ft^2) area. Vegetation there was dense, consisting of both coniferous and deciduous trees and shrubs, ferns, and mosses (Figure 23).

East Huron Island:

Plot 1. Grass-shrub

Grasses and shrubs, especially ninebark (Physocarpus opulifolius) and chokecherry, were the main plants in this 230 m^2 (2500 ft^2) plot. There were no trees on the site (Figure 24).

Plot 2. Open shrub-rock

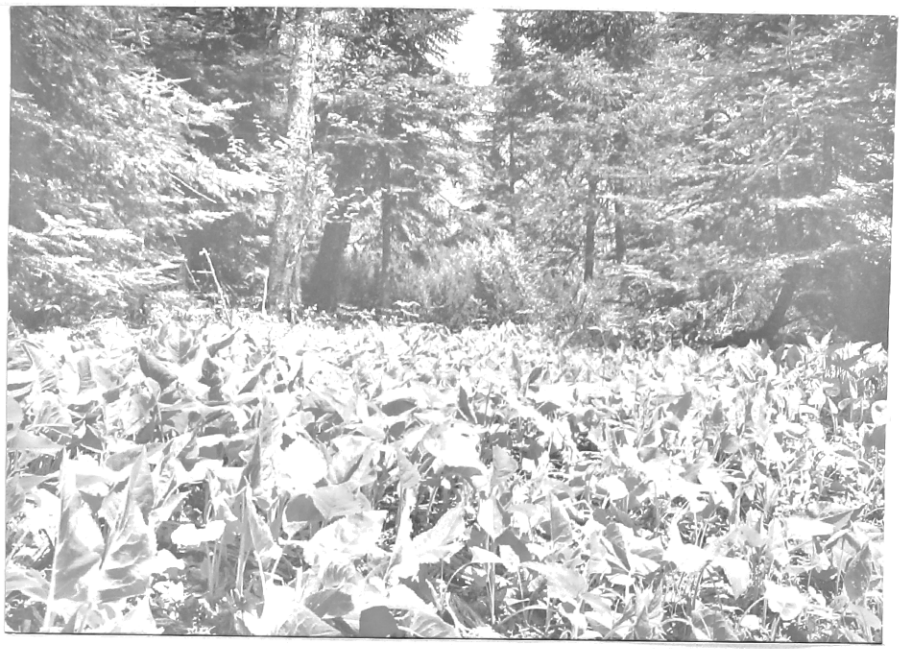
This 460 m^2 (5000 ft^2) site was in a .2-hectare (.5-acre) section of open rocky shoreline. Shrubs were frequent in the crevices of the rock, and there were some scattered red pine trees (Figure 25).

Plot 3. Balsam fir-no ground cover

There was little ground cover in this 460 m^2 (5000 ft^2) stand of medium-sized balsam firs, other than fallen needles and some sticks (Figure 26).

G. Smith

Figure 21. Balsam fir-lichen plot on Huron Island.



G. Smith

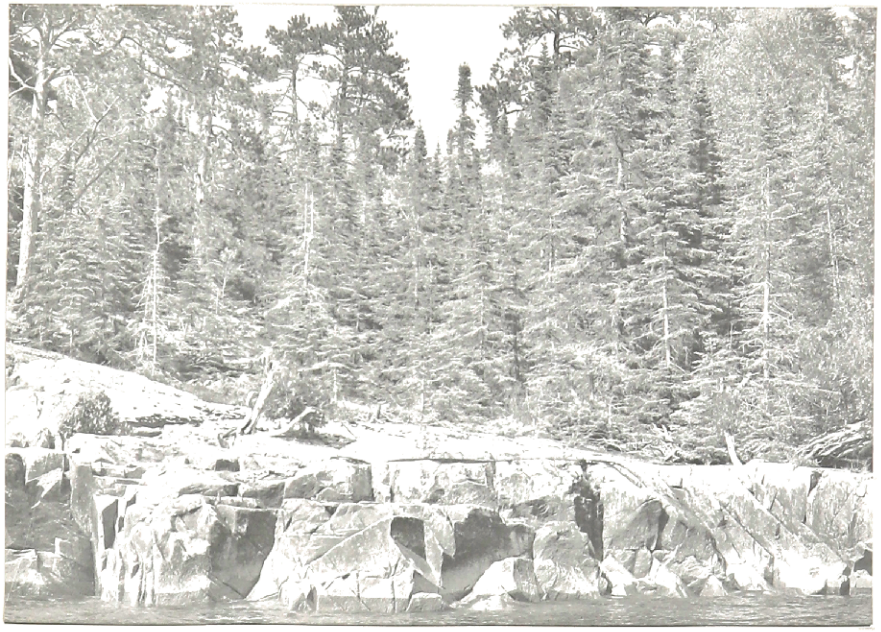
Figure 22. West end of yew-balsam fir-swamp plot, Huron Island. Large-leaf asters cover the foreground.

G. Smith

Figure 23. Swamp portion of yew-balsam fir-swamp plot.

C. Corin

Figure 24. Grass-shrub plot on East Huron Island.



G. Smith

Figure 25. Open shrub-rock plot on East Huron Island.

C. Corin

Figure 26. Balsam fir-no ground cover plot on East Huron Island.

Plot 4. Black spruce-balsam fir-rock

Portions of this 695 m^2 (7400 ft^2) area were dry and rocky with balsam firs and red pines. Low blueberry bushes grew among the rocks. Pockets of damp areas contained sphagnum, Laborador tea (Ledum groenlandicum), and black spruce (Figure 27). This site was similar to most of the northern shore of the island.

Plot 5. Yew-balsam fir-Michigan holly

This damp 400 m^2 (4275 ft^2) area was part of a shallow gully about .4 km (.25 mi) long which runs across the western half of the island from south to north. Ground cover was dense, consisting mainly of American yew, with Michigan holly in the wetter portions (Figure 28).

C. Corin

Figure 27. Black spruce-balsam fir-rock plot on East Huron Island.

C. Corin

Figure 28. Damp portion of yew-balsam fir-Michigan holly plot on East Huron Island.

RESULTS AND DISCUSSION

Four species of amphibians, 2 reptiles, 64 birds, and 5 mammals were observed on Huron and East Huron Islands. Identification of mammal scats found on the islands and records from other sources added 3 mammal and 11 bird species to this list.

In the following sections the terrestrial vertebrates of the Huron Islands will be discussed in taxonomic order.

AMPHIBIANS

The amphibians and reptiles observed on the Huron Islands are listed in Table 1.

Ambystoma sp.

A larval salamander believed to be of the genus Ambystoma was seen on East Huron Island in a shallow pool in the rocks on the north shore of the island, on 14 July. The pool was about 4.5 m (15 ft) long, 1.8 m (6 ft) across, and about .3 m (1 ft) deep. The larva appeared to be about 5 cm (2 inches) in length and brownish colored.

The blue-spotted salamander (Ambystoma laterale) is found on Isle Royale (Johnsson and Shelton, 1965). Another ambystomid, the tiger salamander (Ambystoma tigrinum), is reported from the Apostle Islands (Stadnyk, et al., 1974). Other salamanders known to occur on Lake Superior islands include the red-backed salamander (Plethodon cinereus cinereus), the mudpuppy (Necturus maculosus), and the red-spotted newt (Diemictylus viridescens viridescens) (Johnsson and Shelton, 1965; Stadnyk, et al., 1974). Manville (1942, 1948) reported the red-spotted newt, the spotted salamander (Ambystoma maculatum), the blue-spotted salamander, and the red-backed salamander from the Huron Mountain Club area. Werner (1973, 1975) reported the red-backed salamander, the four-toed salamander (Hemidactylium scutatum), the blue-spotted salamander, and the central newt (Diemictylus viridescens louisianensis) from the McCormick Experimental Forest. He found the

Table 1. Amphibians and reptiles observed on Huron Island and East Huron Island, Lake Superior, during present study.

Huron	East Huron	
		AMPHIBIA
	X	*Ambystoma* sp.
X	X	*Bufo americanus*, American Toad
X	X	*Hyla crucifer crucifer*, Northern Spring Peeper
	X	*Rana clamitans melanota*, Green Frog
		REPTILIA
X	X	*Thamnophis sirtalis sirtalis*, Eastern Garter Snake
X		*Storeria occipitomaculata occipitomaculata*, Northern Red-bellied Snake

blue-spotted salamander to be few in number and near the water's edge, thus they might be able to swim or be rafted to islands. The central newt is more aquatic than any of the others, so could be expected near islands. The four-toed salamander is a rare bog resident, probably not likely to be found on the Huron Islands. Red-backed salamanders are common in the Upper Peninsula, but the species is terrestrial at all stages of the life cycle, which could explain their absence from the Huron Islands and Isle Royale. However, they are found on the Apostle Islands (Stadnyk, et al., 1974) and the Beaver Island archipelago (Hatt, et al., 1948). They and their egg masses are often found in decaying logs (Hatt, et al., 1948; Werner, 1973, 1975), so they could drift to islands in logs.

Salamanders could arrive at islands by swimming, or by drifting, either in logs or as larvae. Hatt (1948) found that the distribution of salamanders was very spotty on the islands in eastern Lake Michigan, and attributed this to accidental dispersal of these animals by drifting logs.

American Toad (Bufo americanus)

An American toad was observed on Huron Island on 30 June. It was on a wooden walkway that runs around the Coast Guard barracks building on the northwest end of the island. The area around it is grassy and damp, with sphagnum underlying the grass in spots. On East Huron Island what were believed to be toad tadpoles were found in pools on the rocks on the north side and west end of

the island. Johnsson and Shelton (1965) report the American toad as very common on Isle Royale, and they are also found on the Apostle Islands (Stadnyk, et al., 1974). Manville (1942, 1948) reported them as common throughout the Huron Mountain area, and according to Werner (1973, 1975) they are common in the McCormick Forest.

The toad is terrestrial as an adult except in the breeding season, but Werner (pers. comm.) has seen them swimming far out in lakes in the McCormick tract. It is likely that they reached the Huron Islands by swimming.

Northern Spring Peeper (Hyla crucifer crucifer)

Three adult northern spring peepers were found in a pool in a rock cleft on the northwest end of Huron Island. They were calling during June, but no eggs or tadpoles were seen. On East Huron Island tadpoles that were probably Hyla were found in rocky shore pools, but no adults were heard or seen. They are common on Isle Royale (Johnsson and Shelton, 1965) and are found on the Apostle Islands (Stadnyk, et al., 1974). Manville (1942, 1948) reported that they were abundant in the Huron Mountain area, and Werner (1975) also found that they were abundant in the McCormick Forest.

Peepers may swim to islands, or, being arboreal except during the breeding season, they may be carried to islands by drifting logs. Hatt (1948) found peepers breeding in beach pools on Lake Michigan islands. In a case like that, eggs may be washed into the lake and carried to other islands.

Green Frog (*Rana clamitans*)

One male and three female green frogs were seen in the pond on East Huron Island's north shore (Figure 7, p. 16). No tadpoles were found.

These frogs are common on Isle Royale (Johnsson and Shelton, 1965), and are found on the Apostle Islands (Stadnyk, *et al.*, 1974). In Lake Michigan, Hatt (1948) found that they were present but not abundant on either North Manitou or Beaver Island. Manville (1942, 1948) reported the green frog in the Huron Mountains, and Werner (1973, 1975) found it to be common in the McCormick tract.

Green frogs are usually found at the edges of ponds, lakes, marshes, bogs and streams (Werner, 1975) and are quite aquatic as adults, so it is probable that they swam to the islands.

The lack of permanent ponds on Huron Island is probably a limiting factor there in the establishment of green frogs on that island.

REPTILES

Eastern Garter Snake (Thamnophis sirtalis sirtalis)

Garter snakes were quite abundant on Huron Island, especially in the area around the lighthouse, where they were often seen among the rocks. One snake was found in an area of balsam fir and reindeer lichen. On East Huron Island, these snakes were seen in rocky areas on the north shore. The snakes on Huron Island probably feed mainly on insects and young mice. Green frogs and tadpoles also are possible food sources for the snakes on East Huron Island.

Garter snakes are common on Isle Royale (Johnsson and Shelton, 1965), and on the Apostle Islands (Stadnyk, et al., 1974). Werner (1973, 1975) found them in both aquatic and woodland habitats in the McCormick Forest.

Garter snakes are frequently seen swimming, and probably reach islands in that manner (Hatt, et al., 1948).

Northern Red-bellied Snake (Storeria occipitomaculata occipitomaculata)

One red-bellied snake about 24 cm (10 inches) long was captured on 27 June on Huron Island in an area with thick ground cover of grasses, yew, gooseberry (Ribes sp.), and mountain maple saplings.

The red-bellied snake is found in wooded uplands on the mainland, but is not common in upper Michigan (Werner, 1973). Werner (1975) found only one of these snakes in the McCormick Forest. It is the only species besides the garter

snake found on Isle Royale (Johnsson and Shelton, 1965) and on Stockton Island of the Apostle group (Stadnyk, et al., 1974)

The red-bellied snake's upland habitat would seem to make it less likely than the garter snake to reach islands, but it has been successful in doing so in this region. There is little known about this snake in this area because of its apparent scarcity. Possibly the red-bellied snake visits aquatic habitats more commonly than is thought.

BIRDS

Table 2 lists the 75 species of birds which have been recorded from the Huron Islands. This is fewer than the 109 species found in the McCormick tract (Robinson, 1975) and the 100 common summer birds of the Huron Mountains (Rice, 1973). The comments in the table are based on observation during this study.

Other studies have shown that there are usually fewer bird species on islands than on adjacent mainland areas (Hatt, et al., 1948; Manville, 1951). In most cases the distance between the island and the mainland is no problem, except for the ruffed grouse (Bonasa umbellus) and the spruce grouse (Canachites canadensis), which usually fly no more than a few hundred meters at a time (Johnsson and Shelton, 1965), and consequently are not found on most islands. Van Tyne (1948) noted that the number of species present on the islands in eastern Lake Michigan seemed to be directly related to the size of the island and, to a somewhat lesser extent, to the habitat types present.

The lack of suitable habitat explains the absence of some species from the Huron Islands. Except for accidentals, such as the bobolink (Dolichonyx oryzivorus) which was seen after two days of strong southwest winds, meadow inhabitants were absent, as were marsh birds such as rails and bitterns. Also absent were owls and, except for transients, hawks. The mice on the islands would be expected to provide prey for them, but the dense ground cover of yew and chokecherry in most areas probably makes hunting hard for these predators.

Table 2. Birds recorded from the Huron Islands.

Species	Present Study H	Present Study EH[1]	Previous Records	Status[2] and Comments
Common Loon[3] (Gavia immer)	X	X	L[4]	Common
Red-necked Grebe (Podiceps grisegena)			L	Occasional migrant
Double-crested Cormorant[3] (Phalacrocorax auritus)			M[5], I[6]	Formerly nested
Great Blue Heron (Ardea herodias)	X	X		Common flying over, occasional on shore
Canada Goose (Branta canadensis)		X		Migrants; droppings on shore
Mallard (Anas platyrhynchos)	X	X		Occasional
Black Duck (Anas rubripes)	X	X		Occasional
Common Merganser[3] (Mergus merganser)		X	L, R[7], I	Common
Red-breasted Merganser[3] (Mergus serrator)		X	I	Common
Bald Eagle[3] (Haliaeetus leucocephalus)				Formerly nested on EH

[1]H = Huron Island; EH = East Huron Island

[2]Abundant: seen on nearly every occasion
Common: seen on about half of outings
Uncommon: seen regularly but not commonly
Occasional: seen about five times
Rare: seen only one or two times

[3]Discussed in text

[4]Lennartson, 1972

[5]Manville, 1942

[6]Ilnicky, unpub. ms.

[7]Rice, 1973

Species	Present Study H	Present Study EH	Previous Records	Status and Comments
Osprey (Pandion haliaetus)	X			Rare, flying over
Peregrine Falcon[3] (Falco peregrinus)			M	Formerly nested
American Kestrel (Falco sparverius)		X		Rare
Killdeer (Charadrius vociferus)	X		L	Uncommon
Spotted Sandpiper (Actitis macularia)	X	X	L	Common
Wilson's Phalarope (Steganopus tricolor)			M	Rare
Herring Gull[3] (Larus argentatus)	X	X	M,L,I	Abundant; colonies on all but Huron Island
Caspian Tern[3] (Hydroprogne caspia)	X	X		Rare
Common Nighthawk (Chordeiles minor)	X		L	Uncommon
Chimney Swift (Chaetura pelagica)	X		L	Common
Ruby-throated Hummingbird (Archilochus colubris)	X	X	L	Common on Huron, uncommon on East Huron
Common Flicker (Colaptes auratus)			L	Rare
Pileated Woodpecker (Dryocopus pileatus)				Rare, old holes on East Huron
Yellow-bellied Sapsucker (Sphyrapicus varius)			L	Uncommon, holes seen on Huron
Downy Woodpecker (Dendrocopos pubescens)		X	L	Uncommon
Eastern Kingbird (Tyrannus tyrannus)	X	X	L	Common

Species	Present Study H	Present Study EH	Previous Records	Status and Comments
Great Crested Flycatcher (Myiarchus crinitus)	X			Uncommon
Eastern Phoebe (Sayornis phoebe)			L	Rare
Yellow-bellied Flycatcher (Empidonax flaviventris)	X	X	L	Common
Least Flycatcher (Empidonax minimus)	X			Common
Eastern Wood Pewee (Contopus virens)	X	X		Uncommon on Huron, common on East Huron
Tree Swallow (Tachycineta bicolor)	X	X	L	Abundant, nesting
Barn Swallow (Hirundo rustica)	X	X	L,I	Abundant, nesting on Huron, uncommon on East Huron
Cliff Swallow (Petrochelidon pyrrhonota)	X			Common, nesting
Purple Martin (Progne subis)	X			Rare
Blue Jay (Cyanocitta cristata)	X	X		Uncommon
Common Raven (Corvus corax)	X	X	L	Uncommon
Common Crow (Corvus brachrhynchos)	X	X		Uncommon
Black-capped Chickadee (Parus atricapillus)		X		Common
Red-breasted Nuthatch (Sitta canadensis)	X	X	L	Abundant, nesting
House Wren (Troglodytes aedon)		X		Rare
Winter Wren (Troglodytes troglodytes)	X	X		Common

Species	Present Study H	Present Study EH	Previous Records	Status and Comments
Robin (*Turdus migratorius*)		X	L	Common
Swainson's Thrush (*Catharus ustulata*)	X	X		Common
Ruby-crowned Kinglet (*Regulus calendula*)	X			Common
Cedar Waxwing (*Bombycilla cedrorum*)	X	X	L	Abundant
Solitary Vireo (*Vireo solitarius*)	X			Rare
Red-eyed Vireo (*Vireo olivaceus*)	X	X		Abundant
Black-and-white Warbler (*Mniotilta varia*)	X	X		Abundant
Tennessee Warbler[3] (*Vermivora peregrina*)		X		Uncommon
Nashville Warbler (*Vermivora ruficapilla*)	X			Common
Northern Parula (*Parula americana*)	X	X		Uncommon
Magnolia Warbler[3] (*Dendroica magnolia*)	X	X	L	Abundant, nesting
Yellow-rumped Warbler (*Dendroica coronata*)	X	X		Abundant, nesting
Black-throated Green Warbler (*Dendroica virens*)	X			Uncommon
Blackburnian Warbler (*Dendroica fusca*)	X	X		Common
Chestnut-sided Warbler (*Dendroica pensylvanica*)	X	X		Common
Blackpoll Warbler[3] (*Dendroica striata*)		X		Rare
Ovenbird (*Seiurus aurocapillus*)	X		L	Uncommon

Species	Present Study H	Present Study EH	Previous Records	Status and Comments
Mourning Warbler (Oporornis philadelphia)	X			Uncommon
Yellowthroat (Geothlypis trichas)	X	X		Common
Canada Warbler[3] (Wilsonia canadensis)	X	X	I	Abundant
American Redstart (Setophaga ruticilla)	X	X	L	Abundant
Bobolink[3] (Dolichonyx oryzivorus)	X			Rare
Red-winged Blackbird (Agelaius phoeniceus)	X			Uncommon
Common Grackle (Quiscalus quiscula)	X		L	Uncommon
Cardinal (Cardinalis cardinalis)			R	Rare
Indigo Bunting (Passerina cyanea)	X			Uncommon
Purple Finch (Carpodacus purpureus)	X	X		Uncommon on Huron, common on East Huron
Pine Siskin (Spinus pinus)	X	X	L	Uncommon
White-winged Crossbill (Loxia leucoptera)			I	Rare
Dark-eyed Junco (Junco hyemalis)			L	Probably common in migration
Chipping Sparrow (Spizella passerina)	X	X	L	Common
White-throated Sparrow (Zonotrichia albicollis)	X	X	L	Abundant, nesting
Song Sparrow (Melospiza melodia)	X	X	L,I	Abundant, nesting

Some species which were not seen during this study may be present at other times of the year. Evening grosbeaks (Hesperiphona vespertina), crossbills (Loxia spp.), gray jays (Perisoreus canadensis), and other birds found in conifer areas on the mainland during the winter (Rice, 1973) probably visit the islands.

The Huron Islands provide ideal habitat for some birds. The rocky, brushy portions of shoreline provide possible nesting sites for red-breasted (Mergus serrator) and common mergansers (Mergus merganser). Although no nests have been found, most of the sightings were of pairs of these birds. Common loons (Gavia immer) have been found nesting on lakes in the McCormick Forest (Robinson, 1975). Olson and Marshall (1952) found that loons in northern Minnesota preferred to nest on islands less than .8 hectares (2 acres) in size, and that they located their nests within 1.5 m (5 ft) of the water. The Huron Islands are probably unsuitable for nesting by loons because of their tendency to nest within a few meters of the water and the high chance of nest destruction by large waves. It is possible that non-breeding individuals use large bodies of water to a greater extent than the nesting pairs do (Olson and Marshall, 1952). The coves around the islands were frequently used as feeding and resting areas by loons and mergansers.

The herring gull (Larus argentatus) is the most abundant species of bird on the islands, with nesting colonies on Cattle Island, East Huron Island, and Gull Rock. The

isolation of the islands and the lack of predators are two factors which make the area suitable for nesting. These colonies have been studied fairly extensively. In one of the earliest records, Shiras (1935) reported gulls nesting on the islands in the late 1800's. In 1925, Christy reported 2000-4000 adults (Ilnicky, unpub. ms.). Van Tyne estimated that there were 1000 nesting pairs in 1936 (Ilnicky, unpub. ms.) and Manville observed 1000 pairs in 1940 (Manville, 1942). Ilnicky (pers. comm.) feels that the colony is presently smaller than the 2000 adults reported by Van Tyne and Manville. Seney Refuge personnel observed about 850 gulls, including young, in August, 1972 (Lennartson, 1972). No gull census was carried out during the present study, but it appears that the figure of 1000 pairs is too high for the present colony. It is possible that plant succession has resulted in increased vegetative cover, which may be partially responsible for the decline, since the colonies are confined to the more bare areas.

Manville (1942) banded 50 juvenile gulls in 1940 and 200 in 1941. Ilnicky (unpub. ms.) banded 98 nestlings in 1961, and 173 in 1963. Recovery records show that the gulls from this colony range widely, with birds found as far away as Mexico.

Caspian terns (Hydroprogne caspia) were seen flying past the Huron Islands twice. One was seen on 11 July 1974 at East Huron Island and two were observed flying past both East Huron and Huron Islands on 16 July. The terns were never observed resting on the islands and, although their

nesting habits are similar to those of gulls (Pough, 1951), the Caspian terns probably do not nest on the Huron Islands. These birds are considered to be very rare vagrants in the Lake Superior area. Rice (1973) saw two on 28 June 1972, along the shore near the Huron Mountain Club. One was seen by the author and others at Marquette on 23 May 1974, and another west of Big Bay on 24 June 1974. Robinson (pers. comm.) saw five at the mouth of the Huron River on 16 July 1974. The Caspian tern has not been recorded by the Marquette Audubon Society since 1965 (Rice, 1973). Either 1974 saw an invasion of these terns into the Marquette County area, or they are more numerous here than reports indicate.

Warblers seem to be particularly abundant on the Huron Islands. Fifteen of the 26 species on record for the Huron Mountains (Rice, 1973) were seen on the islands. Three of these 15 are among the 9 warblers considered rare in the Huron Mountain Club area (Rice, 1973). The blackpoll warbler (Dendroica striata), which was seen on 13 July, is on record as a rare spring migrant in Marquette County (Ilnicky, unpub. ms.). The Tennessee warbler (Vermivora peregrina) is probably more common than records indicate, especially during spring and fall migrations. Five were seen at Presque Isle in Marquette on 3 June 1971, and there are two later summer records for Marquette County (Ilnicky, unpub. ms.). Ilnicky feels that this warbler is a common migrant, especially in the fall, and an occasional summer resident. The magnolia warbler (Dendroica magnolia), which

Rice (1973) regarded a rare summer resident at the Huron Mountain Club, was abundant and apparently nesting on the Huron Islands. A male was seen carrying nesting material on 8 June on Huron Island. Robinson (1975) found this warbler to be common in the McCormick Forest as well. The conifer habitat present on the islands is the preferred nesting habitat of these birds (Pough, 1949), which helps explain their abundance there, but not their scarcity in the Huron Mountains, which also contain large conifer tracts. The Canada warbler (Wilsonia canadensis) is another species which seems to be more successful on the Huron Islands than on the mainland. It has not been reported from the McCormick tract, and is uncommon in the Huron Mountains (Rice, 1973). It prefers cool, moist areas (Pough, 1949), which does not explain its apparent rarity on the mainland, because such habitat is available there.

Three species formerly but apparently no longer present on the islands are of particular interest. The only known nesting colony of double-crested cormorants (Phalacrocorax auritus) on Lake Superior was located on the Huron Islands. On 27 June, 1936, Van Tyne discovered two nests, and in 1937 there were seven nests (Manville, 1942). Between 1938 and 1942 the number of nests varied between seven and eight (Manville, 1942; Ilnicky, unpub. ms.). The highest recorded population was in 1941, when there were 14 adults and 8 nests, but all of the nests that year were destroyed, apparently by fishermen (Manville, 1942). The last nesting record is from 1960, when Dodge reported two nests and eight

adults flying over (Ilnicky, unpub. ms.). No birds have been seen at the Huron Islands since 1962, and there are no official summer, fall, or winter records from Marquette County since 1963 (Ilnicky, unpub. ms.).

The peregrine falcon (Falco peregrinus) has nearly disappeared from much of its former range, including the Huron Islands (Hickey, 1969). Tuttle (Manville, 1942) reported that falcons nested on the islands in 1936, and a bird which may have been a peregrine was seen at the islands in 1942 (Manville, 1942). Bayard Christy felt that the peregrine did not nest on the islands after 1938 or 1939 (Ilnicky, unpub. ms.). Presently the peregrine is considered a very rare vagrant at the Huron Mountain Club (Rice, 1973).

A nest in a large white pine on East Huron Island (Figure 29) is evidence that bald eagles (Haliaeetus leucocephalus) bred on the island at one time. This is another raptor which has undergone a serious population decline. In national forests of Michigan, Minnesota, and Wisconsin, there were only 119 young produced from 170 active nests observed in 1974, a rate of .7 young per active nest, compared with a rate of .8 young per active nest in 1964 (U.S. Forest Service, 1974). The bald eagle is a rare summer visitor in the Huron Mountains (Rice, 1973), but there were no confirmed sightings at the Huron Islands during this study, although a bird which may have been an eagle was seen at a great distance, near the mainland shore, on 11 July.

Despite the relatively small area and limited number

C. Corin

Figure 29. Abandoned bald eagle nest on East Huron Island.

of habitats on the Huron Islands, their avifauna is very rich. The islands seem to be ideal for species such as the herring gull, which require a minimum of disturbance during nesting, and for many smaller birds, such as warblers, which may benefit from the scarcity of predators during the nesting season.

MAMMALS

The eight mammal species recorded from the Huron Islands and their status during this study are listed on Table 3.

Red Bat (Lasiurus borealis)

Two bats were seen nightly near the buildings on the northwest end of Huron Island. They were identified as red bats by their steady flight and habit of flying repeatedly over the same 30-m (100-yard) path (Burt, 1957).

This is a solitary species which roosts in trees. The red bat is known to occur in Marquette County (Laundre, 1975), but neither Manville (1942) nor Laundre (1975) observed the species in the Huron Mountains. Robinson (1975) feels that it is probably present in the McCormick Experimental Forest, about 29.5 km (18 mi) from the Huron Islands, since it has been found in Gogebic and Chippewa Counties.

Bats have no problem reaching islands. The red bat was not observed on Isle Royale, 24.5 km (15 mi) from the Canadian mainland, until 1971 (Nichols and Stones, 1971), but that may have been because the bat is solitary and not usually abundant, so may have been overlooked. Hatt, in 1916, observed a red bat on North Manitou Island in Lake Michigan, 11.5 km (7 mi) from the mainland (Hatt, et al., 1948), and a bat believed to be a red bat was seen on Beaver Island in 1962, 24.5 km (15 mi) from land (Ozoga and Phillips, 1964).

Table 3. Mammals recorded from the Huron Islands and their status during the present study.

Huron	East Huron	Species	Status
X		Red Bat (*Lasiurus borealis*)	Resident
X		Black Bear (*Euarctos* = *Ursus americanus*)	Scat found, probably over 6 months old.
X		Raccoon (*Procyon lotor*)	Scat found, a few months old.
X	X	Coyote (*Canis latrans*)	Scats found, from previous winter.
X	X	Snowshoe Hare (*Lepus americanus*)	Resident
X	X	Meadow Vole (*Microtus pennsylvanicus*)	Resident
	X	Red-backed Vole (*Clethrionomys gapperi*)	Resident
X		Woodland Deer Mouse (*Peromyscus maniculatus gracilis*)	Resident

It is possible that other bats may occur on the Huron Islands, at least occasionally. The little brown myotis (Myotis lucifugus) is common at the Huron Mountain Club, and its habit of roosting in buildings may bring it to Huron Island. This species is found on Isle Royale (Johnsson and Shelton, 1965). The keen myotis (Myotis keenii) probably also occurs in the Huron Mountains (Manville, 1942), and is found on Isle Royale (Johnsson and Shelton, 1965). Another colonial species which is apparently present in very low numbers in the Huron Mountains is the big brown bat (Eptesicus fuscus) (Manville, 1942; Laundre, 1975).

Two other solitary species which may reach the Huron Islands are the hoary bat (Lasiurus cinereus) and the silver-haired bat (Lasionycterus noctivagans). Two specimens of the hoary bat from Keweenaw County are in the University of Michigan Museum of Zoology (Robinson, 1975). There are no records of this species in the Huron Mountains (Manville, 1942; Laundre, 1975), or on Isle Royale (Johnsson and Shelton, 1965). Manville (1942) sighted what he believed to be a silver-haired bat at the Huron Mountain Club in 1939, but Laundre (1975) found none, citing its rarity over most of its range as the reason for its apparent absence.

Black Bear (Euarctos = Ursus americanus)

Seney National Wildlife Refuge personnel found the skull, vertebrae, and limb bones of a bear on the shore of Cattle Island, and surmised that the bear had drowned and been washed ashore there (Lennartson, 1972). It is also

possible that the bear swam to the islands, then died. Two scats were collected in the white pine area on Huron Island which may have been the product of a small bear. They were about 27 mm (1.1 inches) in diameter, and totalled about 15 cm (6 inches) in length. They consisted mainly of huckleberry (Gaylussacia baccata) seeds and crushed shells, with pieces of a beetle (Coleoptera), a grasshopper (Orthoptera) femur, deer mouse (Peromyscus maniculatus) hair, and a small amount of what appeared to be snowshoe hare (Lepus americanus) hair. The scats appeared to be at least six months old.

Stadnyk, et al. (1974) report that bear sign was frequent on Stockton Island in the Apostle Islands. Stockton Island is much larger than the Huron Islands, approximately 37 km^2 (14 mi^2), and can be reached from the mainland over water gaps between islands of about 3.2 km (2 miles). Apparently the 24.5-km (15-mile) crossing to Isle Royale is too far for the black bear to swim, since they have never been observed on that island (Johnsson and Shelton, 1965). The fact that the bear is inactive in the winter probably limits its dispersal to islands (Jackson, 1919; Hatt, et al., 1948).

Raccoon (Procyon lotor)

The raccoon has been present recently on the Huron Islands. Coast Guard personnel (pers. comm.) reported that a raccoon visited the area near the buildings on the northwest end of Huron Island during the summer of 1973.

when they were there doing maintenance work. In this study no recent signs of a raccoon were seen, to that animal may have died or left the island. An old scat believed to be that of a raccoon was found near the south end of Huron Island.

The raccoon is not recorded from either Stockton Island (Stadnyk, et al., 1974) or Isle Royale (Johnsson and Shelton, 1965). It increased from rare status in 1942 (Manville, 1942) to common in 1974 (Laundre, 1975) in the Huron Mountains. Its absence or near absence on Lake Superior islands may be due to the fact that it is a recent arrival to this region and has had relatively few years to disperse to islands.

The raccoon is generally inactive in the winter, although on warm days in late winter they travel considerable distances. This is the time when ice is present between the shore and the Huron Islands, so they may be able to reach the islands then.

Coyote (Canis latrans)

The coyote is not resident on the Huron Islands during the summer, but Greg Smith (pers. comm.) reports seeing them about .4 km (.25 mile) from shore travelling across the ice towards the islands during the winter of 1973-1974. It is likely that coyotes visit the islands when there is a solid ice bridge, and feed on hares and mice. One coyote scat was found on East Huron Island, and two scats which may have been either bear or coyote were found on Huron

Island. None of the scats was very recent.

Coyotes are common in the Huron Mountains (Laundre, 1975). They have been observed in the Apostle Islands (Stadnyk, et al., 1974) and occurred on Isle Royale until the wolf became established there in the 1950's (Johnsson and Shelton, 1965; Mech, 1966).

Coyotes probably reach islands by crossing the ice rather than by swimming (Ozoga and Phillips, 1964). The Huron Islands are too small to support a permanent population, but coyotes are occasional visitors during the winter.

Snowshoe Hare (Lepus americanus)

Hares were seen frequently on Huron Island, but not as often on East Huron Island. They were seen mainly along the trail, in the balsam fir areas, on Huron. Snowshoe hares inhabit coniferous areas, where they generally remain under cover during the day and forage at night (Burt, 1957). There were abundant signs of their browsing, especially on mountain maple, and their droppings were plentiful. Over half of the animals observed were juveniles, but some of these sightings may have been of the same individuals, since they were in the same general area. All of the hares seen were parasitized by ticks (Acarina), especially on the face and ears. On Huron, No. 1 Havahart traps were set for 36 trap-nights, but no hares were captured.

Manville (1942) and Laundre (1975) both noted that the snowshoe hare is common in the Huron Mountains, and Robinson (1975) found it to be abundant in the McCormick tract.

The snowshoe hare is an active animal which can be expected to reach islands by crossing ice in the winter. It has apparently been able to reach most of the islands in this area, including the archipelago in eastern Lake Michigan (Hatt, et al., 1948; Ozoga and Phillips, 1964), the Apostle Islands (Stadnyk, et al., 1974), and Isle Royale (Johnsson and Shelton, 1965; Mech, 1966).

In all parts of its range the hare is an important prey species for carnivorous animals (Burt, 1957). In this area the coyote is a major predator of the hare (Ozoga and Harger, 1966), and on the Huron Islands the hare is probably preyed upon by coyotes during the winter.

Meadow Vole (Microtus pennsylvanicus)
Red-backed Vole (Clethrionomys gapperi)
Woodland Deer Mouse (Peromyscus maniculatus gracilis)

The meadow vole occurred on both islands studied. The deer mouse was found only on Huron Island and the red-backed vole only on East Huron Island.

Table 4 summarizes the population estimates for these species. The density figures may not be entirely accurate due to the uncertainties involved in determining the sizes of many of the trapping areas and to the low recapture rates of the red-backed vole and the meadow vole.

The small sizes and rugged terrain of six of the twelve plots on Huron and one of the five on East Huron Island required that the traps on those sites be set in single straight or bent lines. In the rest of the plots there were

Table 4. Population estimates for mice on the Huron Islands, with 95 percent confidence limits[1] in parentheses.

	Huron Island		East Huron Island	
	Peromyscus	*Microtus*	*Clethrionomys*	*Microtus*
Number of individuals captured	64	36	14	11
Lincoln estimate	84 (55-123)	--	15 (4-44)	20 (1-390)
Schnabel estimate	78	--	11	20
Densities:				
Lincoln	51/acre 125/ha.	22/acre[2] 54/ha.	27/acre 68/ha.	36/acre 91/ha.
Schnabel	47/acre 116/ha.		20/acre 50/ha.	36/acre 91/ha.

[1] Overton, 1971

[2] This figure uses the number of individuals captured, since there were no recaptures of *Microtus* on Huron Island.

two more or less parallel lines. A border of one-half the distance between traps, 3.7 m (12.5 ft), was used when determining the areas of the plots. The total of all the areas trapped was used when calculating the population densities on each island, because the data from any one plot were generally too few to provide accurate estimates. The total area sampled on Huron Island was approximately .67 hectare (1.65 acres) and on East Huron the area was .22 hectare (.55 acre). This comes to about 4.1 percent of the total area of Huron and .7 percent of the total area of East Huron Island.

The accuracy of population estimates depends to a great extent upon the percentage of recaptures in the sample. This in turn depends upon the susceptibility of the animals to trapping. It can probably be assumed that if a species is particularly easy to trap, a greater percentage of its numbers will be caught at the beginning of a trapping period than if the species is difficult to capture (Beer, et al., 1954).

Table 5 shows the percentages of individuals captured on the first day of the 3-day trapping periods on the Huron Islands and on islands greater than 3.64 hectares (9 acres) in size in Basswood Lake, Minnesota (Beer, et al., 1954). The Minnesota study indicates that the deer mouse is the most easily trapped of the three species studied, with the red-backed vole second and the meadow vole the most difficult to capture. On the Huron Islands, the deer mouse also proved the most vulnerable. The meadow vole and the red-

Table 5. Percentages of individual mice captured on the first day of three-day trapping periods on islands larger than 3.6 hectares (9 acres) in Basswood Lake, Minnesota,[1] and the Huron Islands.

Species	Percentages captured on first day			
	Minnesota	Huron Island Period 1	Huron Island Period 2	East Huron
Peromyscus maniculatus	67	39	41	--
Clethrionomys gapperi	64	--	--	29
Microtus pennsylvanicus	54	33	25	27

[1]Beer, et al., 1954

backed vole were about equal in susceptibility and were much less readily trapped than the deer mouse.

The lower vulnerability to trapping shown by the mice on the Huron Islands may be the result of high population densities. Beer et al. used snap-traps spaced 9 m (30 ft) apart in lines 30 m (100 ft) apart. The live traps on the Huron Islands were set somewhat more closely, 7.4 m (25 ft) apart. Both the fact that the traps on the Huron Islands were closer and that they were live traps would tend to increase the percentage of individuals captured on the first day, if the population densities in the areas were equal. In a denser population there would be a lower percent of the total population captured at any one time. So although Beer et al. did not estimate population density it appears that mouse densities were considerably greater on the Huron Islands than on the islands in Basswood Lake, Minnesota.

Catch per unit effort is another indicator of population density. Tables 6 and 7 show the catch per unit effort for each plot and each island as a whole during this study. In the Minnesota study, the highest capture success rates for the three species over a 3-year period were 3.42 per 100 trap-nights for Microtus, 2.25 per 100 trap-nights for Peromyscus, and 3.37 per 100 trap-nights for Clethrionomys, as compared with a range of 8 to 52 per 100 trap-nights for the same three species on the Huron Islands. This further suggests high mouse densities on the Huron Islands.

The population density of the deer mouse on Huron Island is probably close to or slightly higher than the

Table 6. Relative abundance of mice in various habitats on Huron Island, as shown by trapping success expressed as captures per 100 trap-nights (t-n). Percent of total catch in each habitat is shown in parentheses.

Habitat	Trap-nights	P.m.[1] per 100 t-n	M.p.[2] per 100 t-n	Total per 100 t-n
Dry grass-rock	38.5	89 (100)	0[3]	89
Open shrub-rock	23.5	77 (100)	0	77
Grass-balsam fir	12	75 (90)	8 (10)	83
White Pine	14.5	69 (100)	0	69
Red-osier dogwood	13.5	59 (89)	7 (11)	68
Damp grass-rock	36	58 (81)	14 (19)	72
Balsam fir-yew	18	50 (100)	0	50
Yew-balsam fir-swamp	34	43 (83)	9 (17)	52
Chokecherry shrub	14.5	41 (100)	0[3]	41
Grassy-shady	18.5	32 (43)	43 (57)	75
Grassy	5.5	19 (100)	0	18
Balsam fir-lichen	15	0	0	0
TOTAL	213.5	52 (86)	8 (14)	60

[1] P.m. = Peromyscus maniculatus

[2] M.p. = Microtus pennsylvanicus

[3] Microtus were seen, but not captured, in these areas.

Table 7. Relative abundance of mice in various habitats on East Huron Island, as shown by trapping success expressed as captures per 100 trap-nights (t-n). Percent of total catch in each habitat is shown in parentheses.

Habitat	Trap-nights	C.g.[1] per 100 t-n	M.p.[2] per 100 t-n	Total per 100 t-n
Black spruce-balsam fir-rock	34.5	32 (91)	3 (9)	35
Yew-balsam fir-Michigan holly	19	32 (76)	10 (24)	42
Balsam fir-no ground cover	23	17 (100)	0	17
Grass-shrub	12	0	78 (100)	78
Open shrub-rock	24	0	0	0
TOTAL	112.5	20 (64)	11 (36)	31

[1] C.g. = Clethrionomys gapperi

[2] M.p. = Microtus pennsylvanicus

125 per hectare (51 per acre) estimated by the Lincoln Index (Table 4, p. 69). Robinson (pers. comm.) had a capture success of 34.3 per 100 trap-nights in a hardwood-white pine area in the McCormick Forest. He estimated the density by Lincoln and Schnabel methods to be between 54 and 121 per hectare (22 and 49 per acre). That averages to about 86 per hectare (35 per acre). If that is the case, the trapping success of 52 per 100 trap-nights on Huron would indicate a density of about 138 per hectare (52 per acre), slightly higher than the calculated value.

Laundre (1975) found that deer mouse densities in five habitats on the Huron Mountain Club ranged from 35 per hectare (14 per acre) in an open meadow to 89 per hectare (37 per acre) in a white birch habitat, with an average density of 52 per hectare (21 per acre). Capture success in other studies shows that the Huron Island population is high. Ozoga and Phillips (1964) found from 6 to 15 deer mice per 100 trap-nights in various habitats on Beaver Island, Lake Michigan. Ozoga and Verme (1968) caught 7 per 100 trap-nights in a mixed habitat in the central Upper Peninsula. These figures suggest lower deer mouse populations in their areas than on the Huron Islands.

The meadow vole, because of its low susceptibility to trapping, may be underestimated in a short trapping period (Webb, 1965). The fact that none were captured near the lighthouse, where an adult and three juveniles were seen twice, or in the chokecherry shrub plot, where voles were frequently observed crossing the footpath, tends to support

this. It was difficult to make an accurate population estimate since none of the meadow voles on Huron Island and only one on East Huron Island were recaptured. Based on the assumption that there is an inverse relationship between the population density and the percent of the individuals in the population that will be captured on the first day of trapping, the meadow vole probably outnumbers the deer mouse on Huron Island. On East Huron Island, the meadow voles appeared to be more restricted in habitat than on Huron Island. Most of them were caught in the grass-shrub plot, where the density was quite high, with a capture success of about 78 per 100 trap-nights. The meadow vole is much more abundant on the Huron Islands than in other areas of the Upper Peninsula. Laundre (1975) caught only one in 193 trap-nights in an open meadow in the Huron Mountain Club. Robinson (1975) captured 6 meadow voles in bog habitat in the McCormick tract, and noted that no investigators in upper Michigan have reported more than 25 per hectare (10 per acre). It would appear that the meadow vole population on the Huron Islands is abnormally high for this area.

The red-backed vole is nearly as susceptible to trapping as the deer mouse (Beer, et al., 1954). Again, the Lincoln estimate of about 68 animals per hectare (27 per acre) is probably low, based on the first-day capture percent and the captures per unit effort. Laundre (1975) found 19 voles per hectare (8 per acre) in black spruce in the Huron Mountains,

and Robinson (1975) estimated 15 to 20 per hectare (6 to 8 per acre) in hardwood-white pine and white birch-aspen habitats in the McCormick Forest. Ozoga and Verme (1968) captured these voles in conifer swamps. In mature cedars they had a capture rate of 11 per 100 trap-nights in the fall of 1966. In this study the capture rate in conifer areas was much higher, up to about 32 per 100 trap-nights.

In general it appears that densities of the three species of mice on the Huron Islands are considerably higher than in similar habitats in comparable areas at this latitude. There are several possible reasons for the high densities found in this study. One is that the trap-line method produces higher density figures, in some situations (Stickel, 1948), than the grid method used by other workers, including Laundre (1975) and Robinson (1975). The limited area of the islands probably results in higher population densities. A low predation rate on the islands is probably also an important factor. No raptors were observed hunting on the islands, and only one kill of a meadow vole, possibly made by a bird, was found on Huron Island. Foxes and coyotes are not present on the islands in the summer. The large garter snakes probably feed on young mice but evidently do not prey on adult mice to a great extent. An adult deer mouse, blind but otherwise apparently healthy, was caught in the area where most of the snakes were observed. The presence of a blind mouse suggests low predation pressure.

The low amount of predation is probably one reason for the high meadow vole population, which was striking,

especially considering their low numbers on the mainland (Laundre, 1975; Robinson, 1975). Other workers have reported that the abundance of meadow voles on many islands may be partially due to their high reproductive potential (Werner, 1956; Crowell, 1973), and ability to utilize habitats other than grasslands when they have the chance (Cameron, 1964; Clough, 1964; Morris, 1969).

Table 6 (p. 73) shows the relative abundances of the deer mouse and the meadow vole in various habitats on Huron Island. Again, the figures are probably biased by the differences in trapping susceptibility. Deer mice were the most widespread, found in all habitats except the balsam fir-lichen area, which provided very little ground cover. Meadow voles were found in a variety of habitats, but were absent in three of the coniferous areas and the open rocky area. They outnumbered deer mice only in the grassy-shady plot. Most of the areas in which they were found, except the grassy plots 1 and 2, were either predominantly shrubby or surrounded closely by trees. Meadow voles are found in wooded habitats on many islands (Manville, 1951; Cameron, 1964; Grant, 1971; McPherson and Krull, 1972; Stadnyk et al., 1974). Getz (1970) suggests that the amount of ground cover may be more significant than the presence of grasses, and that meadow voles do not actively select for either area. On many islands there are few competitors or predators to keep the meadow voles out of the forest, and if there is little grassy habitat, as on the Huron Islands, one should

expect to find them in more wooded areas.

Grant (1970b) used arenas with equal amounts of grassland and woodland habitat to investigate the influence of Microtus, Clethrionomys, and Peromyscus species on one another. He found that when two animals of the same or different species were placed in the enclosure, one animal usually held the competitive advantage. Grant found that when meadow voles from islands were enclosed with deer mice the meadow voles were more restricted to the grassland habitat than when the deer mice were not present. The deer mice showed no significant habitat restriction when in the presence of meadow voles. This could explain why the deer mice are more widespread than the meadow voles on Huron Island, and why the meadow vole may be found in unusual habitats on islands when other species are not present.

The occurrence of both meadow voles and red-backed voles on East Huron Island leads to further hypotheses on habitat use and the possibility of competitive exclusion. Studies have shown that Microtus and Clethrionomys usually do not coexist in the same area, though they may use the same habitat types on islands (Cameron, 1964; Clough, 1964; Stadnyk, et al., 1974). Segregation of these two species is more distinct than between the deer mouse and the meadow vole. Of five habitats sampled on East Huron Island only two contained both meadow voles and red-backed voles, while of the 11 habitats which had mice on Huron Island, 7 held both meadow voles and deer mice. The usual habitat of the red-backed vole includes moist hardwood and conifer forests,

with abundant ground litter (Burt, 1957). Laundre (1975) captured these animals in black spruce, and also found them in a maple area and a white cedar area. In the present study they were found in their expected habitats, the black spruce and the damp, mixed coniferous-deciduous area. Some were also found in an area with very little ground litter (plot 3). Parts of this plot were probably included in the home ranges of the two individuals caught there.

Miller and Getz (1973), studied the habitats of red-backed voles in Vermont and Connecticut and concluded that a high amount of moisture was necessary for this species, and that debris cover was the major factor affecting the distribution within damp areas. The data show that on East Huron Island the red-backed vole was most abundant in the damp areas. The drier nature of Huron Island may be a reason for their absence on that island, although the 1.6-km (1-mile) gap between the islands could also impede dispersal.

In an analysis of data on four genera of mice (Microtus, Peromyscus, Clethrionomys, and Apodemus) from three locations, Grant (1970a) found that on islands with two genera, Microtus and Clethrionomys were the least likely to occur together. He suggested that possible reasons for this include the unlikelihood of suitable available habitats for both species in a small area, differences in dispersal and establishment rates, and differential compatibility with Peromyscus. Since Microtus feed primarily on herbaceous plants and Clethrionomys add conifer seeds and possibly insects to their diets (Burt,

1957), the habitat may be an important factor. But since meadow voles are often found on completely forested islands, the differences in dispersal and establishment abilities and interspecific interaction are probably more important factors on mostly forested islands like the Huron Islands.

There is evidence for competitive exclusion between these two genera (Cameron, 1964; Morris, 1969; Grant, 1970a, 1970b, 1972). Grant (1970b) found that meadow voles from islands were significantly restricted in their habitat by red-backed voles, but that red-backed voles were not restricted by meadow voles. Cameron (1964) also found evidence of this on British islands (with M. agrestis and C. glareolus) and on the North American mainland. In the aspen parkland of Saskatchewan the two species occupy different habitats in the summer, but in the winter the meadow voles are found in higher numbers in the aspen stands than in the grassland (Morris, 1969). This may be due to the insulation provided by the deeper snow in the aspens. The two species were evidently able to coexist in the winter. On Otter Island in the Apostle Islands of Lake Superior, Stadnyk et al. (1974) found meadow voles only on a small grassy point, with red-backed voles inccclearings around abandoned buildings. Two years later, most of the red-backed voles were gone, and the meadow voles had moved into the clearings. They hypothesized that the red-backed voles were at a low point in their population cycle, enabling the meadow voles to extend their range.

The situation on East Huron supports the hypothesis that Clethrionomys restricts Microtus from woodlands. Meadow voles were dense on the grass-shrub plot, but were not found in large numbers in any other area. The only ones captured outside of the grassy areas were juveniles, which may have been dispersing.

Grant (1970a) suggests that Peromyscus excludes Clethrionomys, enabling Microtus to become established on islands with deer mice more readily than on islands with red-backed voles. In another study, however, he found that Clethrionomys was not affected in its habitat use by Peromyscus (Grant, 1970b), and that the two were able to coexist (Grant, 1972). It has also been suggested that, by competition or aggression, an established population can exclude animals of another species which arrive later (Cameron, 1964; Grant, 1972). This could be why deer mice and red-backed voles were not found on the same islands. However, the data in this study are insufficient to determine whether this is because of competitive exclusion or some other factor, such as habitat.

Most studies show that Microtus, Peromyscus, and Clethrionomys do not reach or colonize islands with equal success. Meadow voles are sometimes the only mice found on an island, although other species occur on the nearby mainland or on other nearby islands (Manville, 1951; Crowell, 1973). On islands far from shore, such as Isle Royale in Lake Superior and Beaver Island in Lake Michigan, meadow voles are not present, while deer mice and, to a lesser

extent, red-backed voles, are (Ozoga and Phillips, 1964; Johnsson and Shelton, 1965; Mech, 1966). In Penobscot Bay, Maine, meadow voles have reached islands further from shore than the other two species (Crowell, 1973). It is generally felt that all three species reach islands by crossing on ice (Hatt, et al., 1948; Manville, 1951; Beer, et al., 1954; Ozoga and Phillips, 1964). Since the woodland habits of red-backed voles probably do not bring them to shores as often as the other two species they are the least likely to cross to islands. There is evidence that meadow voles can swim at least 1 km (.6 mile)(Crowell, 1973). The absence of meadow voles from Isle Royale, Beaver Island, and most other islands further than 6.6 km (4 miles) from the nearest land (Werner, 1956), suggests that this animal reaches islands most frequently by swimming. The deer mouse and the red-backed vole, which probably reach islands by crossing ice or by being rafted, are able to reach islands further from shore.

The influence of man in the distribution of mice on islands cannot be discounted. Stadnyk et al. (1974) suggest that hay used in lumbering camps may have been a means of arrival of mice to the Apostle Islands. This is also suggested as a means by which deer mice and red-backed voles reached Beaver Island (Hatt, et al., 1948; Ozoga and Phillips, 1964). However, in other studies human influence has been regarded as very minor (Beer, et al., 1954; Crowell, 1973). Mice, especially meadow voles, may have been brought to the

Huron Islands with fodder if horses or oxen were used to help in the construction of the lighthouse. Deer mice, which are often found in human habitations, may have been accidentally transported in stores for the lighthouse keeper or Coast Guard crew. Aside from this possibility, rafting and ice crossings are probably the most likely means of immigration of mice to the Huron Islands. Studies of currents in Lake Superior have shown that along the southern shore, most surface currents move from west to east (Hughes, Farrell, and Monahan, 1970). The location of the islands 9.8 km (6 miles) due east of Point Abbaye raises the possibility that mice could have drifted from there. Their proximity to the shore and to the mouth of the Huron River suggests that they could have come from that shore as well, either by drifting or by crossing the ice.

COMPARISON WITH MAINLAND MAMMAL FAUNA

The most striking difference between the mammalian fauna of the Huron Islands and that of the adjacent mainland area is the small number of species present. Manville (1942) reported 41 species as probably present in the Huron Mountains, and Laundre (1975) reported 35 positive identifications, with 46 species probably present. Of the 35, only 5, the deer mouse, red-backed vole, meadow vole, snowshoe hare, and coyote, occur with regularity on the islands, with the raccoon probably a sporadic resident. The red bat, which resided on Huron Island, was not reported by either Laundre or Manville.

Many mammals which are absent from the islands are inactive during the winter. The theory that winter habits may determine what mammals populate islands in temperate regions where ice forms was first proposed by Jackson (1919), and has since been supported by many workers, including Hatt, et al. (1948), Beer, et al. (1954), Werner (1956), and Ozoga and Phillips (1964). The eastern chipmunk (Tamias striatus) and the least chipmunk (Eutamias minimus), both common in the Huron Mountain area (Laundre, 1975), were absent from the islands, as were the woodland (Napeozapus insignis) and meadow (Zapus hudsonius) jumping mice. All four of these animals are true hibernators (Burt, 1957). The eastern chipmunk does occur on islands in Lake Michigan (Hatt, et al., 1948; Ozoga and Phillips, 1964). Hatt felt that it was likely, based on the spotty distribution of chipmunks on the eastern Lake Michigan archipelago, that

they had rafted there, but Ozoga and Phillips believed that human introduction was more likely. This chipmunk comes out of hibernation in late March in this area (Manville, 1949). It is possible that it could cross to the islands on ice, as has been proposed in other areas (Werner, 1956), but this has evidently not happened on the Huron Islands. Werner (1956) suggests also that their ability to maintain viable populations on small islands is poor. The least chipmunk is more common in the Huron Mountains than the eastern chipmunk, but it also has not arrived on the islands. It is again likely that its winter inactivity is the reason for this.

The two jumping mice are less common on the mainland than are the chipmunks (Laundre, 1975). They are rarely found on islands, probably due to winter inactivity (Beer, et al., 1954).

Due to the fossorial habits of moles, they are usually absent from islands. Shrews, however, are often found (Beer, et al., 1954; Werner, 1956; Ozoga and Phillips, 1964; McPherson and Krull, 1972; Stadnyk, et al., 1974). It is possible that they are rafted or inadvertently carried by humans (Ozoga and Phillips, 1964). Due to their high food requirement (Burt, 1957) it is unlikely that shrews could cross very large expanses of ice. None were found on the Huron Islands.

The most surprising absence from the Huron Islands was the red squirrel (Tamiasciurus hudsonicus). This species is abundant in most woodland areas on the mainland. Laundre

(1975) estimated 28.4 per hectare (11.5 per acre) in the Huron Mountains. That figure is probably high. Robinson (1975) felt there were about 7.4 per hectare (3 per acre) in the McCormick tract, where the red squirrel is common. They are also very common on Isle Royale (Johnsson and Shelton, 1965; Mech, 1966), and are found on Stockton Island (Stadnyk, et al., 1974). But they are missing from the islands in eastern Lake Michigan (Hatt, et al., 1948; Ozoga and Phillips, 1964). These squirrels are excellent swimmers (Hatt, et al., 1948), and are active in the winter, so would be able to cross the ice. The seeds of conifer cones make up the major portion of the red squirrel's diet (Burt, 1957), so there is an adequate food supply on the islands. But there was no evidence of any feeding activity by squirrels on the Huron Islands. Hatt (1948) surmises that the red squirrel, which undergoes extreme population fluctuations, may be unable to maintain a population on small islands.

Among the mustelids, the river otter (Lutra canadensis) and the mink (Mustela vison) may occasionally visit the islands, although there were no signs of their presence. The otter is uncommon in the Huron Mountains, but the mink is common. (Laundre, 1975). Both are present on Isle Royale (Johnsson and Shelton, 1965; Mech, 1966), so have covered a distance of at least 24.5 km (15 miles) across water, and may be expected to visit the Huron Islands occasionally.

It is possible that the long-tailed (Mustela frenata) and short-tailed weasels (Mustela erminea) were able to go

undetected on the Huron Islands. No sign of their presence was seen. The high population of mice may indicate that weasels were not present during the summer. They are able to reach islands, probably by crossing the ice during the winter. Weasels have been reported from Beaver Island (Ozoga and Phillips, 1964), Isle Royale (Johnsson and Shelton, 1965), and Stockton Island (Stadnyk, et al., 1974).

Among the larger carnivores, the coyote has already been discussed as a visitor to the Huron Islands. The timber wolf could easily reach the islands over the ice, as they did to Isle Royale (Mech, 1966), but due to their rarity in northern Michigan and the small size of the Huron Islands it is not likely that they would utilize them. The red fox (Vulpes fulva), which is common on the adjacent mainland (Laundre, 1975), may arrive on the islands on occasion in winter. The prey supply, especially mice, is abundant, as are berries in the late summer, so it is conceivable that a fox could survive on the islands. Laundre (1975) feels that the population density of red foxes in the Huron Mountains is somewhat less than 3.8 animals per square mile. Since the total area of the islands is about .23 mi^2 it seems unlikely that a viable fox population could be established on the islands without rapidly depleting the food supply.

The bobcat (Lynx rufus), another uncommon resident of the Huron Mountains (Laundre, 1975), is an animal which may visit the islands, although no sign of bobcats was noted. They are not found on Isle Royale (Johnsson and Shelton, 1965; Mech, 1966), but do occur occasionally on

the Apostle Islands (Stadnyk, et al., 1974). Since bobcats normally inhabit areas with good cover (Burt, 1957), they are less likely to travel over the open ice to the islands than the canids are.

There were no signs of white-tailed deer (Odocoileus virginianus) on the Huron Islands, and it is unlikely that they occur there. Deer are native on many of the Apostle Islands (Stadnyk, et al., 1974), and formerly lived on Isle Royale (Johnsson and Shelton, 1965; Mech, 1966). It is probable that the small sizes of the islands and the distance that a deer would have to swim or cross open ice to reach them are the reasons for the absence of deer on the Huron Islands.

CONCLUSIONS

Fewer vertebrate species were found on the Huron Islands than are recorded from the adjacent mainland. Probable reasons for this include the 5-km (3-mile) distance from the mainland, the small sizes of the islands, and their fairly uniform habitat.

The availability of suitable habitat appears to be the main factor limiting the number of avian species. The isolated nature and lack of predation on the islands probably makes them ideal habitat for some birds, particularly herring gulls and many warblers.

Populations of three species of mice were found to be high, probably because of a low predation rate.

The meadow vole was found in more wooded areas on the islands than it is found in on the mainland, consistent with observations in similar studies. It also appears that there may be exclusion of the meadow vole from certain forest habitats by the red-backed vole and, to a lesser extent, by the deer mouse.

Among non-flying mammals, winter habits appear to be the prime factor determining which species will reach islands in this area. All of the mammals recorded from the Huron Islands are active during the winter, except for the bear, which would probably be able to swim to the islands. None of the hibernators which are common on the mainland were found on the islands. Unexplainably, red squirrels are absent from the Huron Islands.

Amphibians and reptiles may reach islands by swimming

or by being rafted, with swimming probably the most common means of arrival. The majority of mammals, including the snowshoe hare, coyote, raccoon, and possibly the mice, probably reached the islands by crossing the ice. Rafting is probably the secondary means of arrival, with swimming the most unlikely, among the small mammals. Human activities may have accounted for the arrival of the deer mouse and the meadow vole.

LITERATURE CITED

Beer, J.R., P. Lukens, and D. Olson. 1954. Small mammal populations on the islands of Basswood Lake, Minnesota. Ecology 35(4):437-445.

Burt, W.H. 1957. Mammals of the Great Lakes region. The University of Michigan Press, Ann Arbor. xv + 246 pp.

Cameron, A.W. 1964. Competitive exclusion between rodent genera Microtus and Clethrionomys. Evolution 18(4): 630-634.

Carlquist, S. 1965. Island Life: A natural history of the islands of the world. The Natural History Press, Garden City. ix + 451 pp.

Clough, G.C. 1964. Local distribution of two voles: evidence for interspecific interaction. Can. Field-Nat. 78: 80-88.

Crowell, K.L. 1973. Experimental zoogeography I: Introduction of mice to small islands. Amer. Natur. 107(956): 535-558.

Darlington, P.J., Jr. 1957. Zoogeography: The geographical distribution of animals. John Wiley & Sons, Inc., New York. xi + 675 pp.

Darwin, C.R. 1909. The origin of species. N.P.F. Collier & Son, New York. 553 pp.

Fernald, M.L. 1950. Gray's manual of botany. American Book Company, New York. 1632 pp.

Getz, L.L. 1970. Influence of vegetation on the local distribution of the meadow vole in southern Wisconsin. U. of Conn. Occas. Papers, Biol. Sci. Series, 1(4): 213-241.

Grant, P.R. 1970a. Colonization of islands by ecologically dissimilar species of mammals. Can. J. Zool. 48(3): 545-553.

———. 1970b. Experimental studies of competitive interaction in a two-species system. II. The behaviour of Microtus, Peromyscus, and Clethrionomys species. Anim. Behav. 18(3):411-426.

———. 1971. The habitat preference of Microtus pennsylvanicus, and its relevance to the distribution of this species on islands. J. Mammal. 52(2):351-361.

———. 1972. Interspecific competition among rodents. In Richard F. Johnston (ed.), Annual review of ecology and systematics 3: 79-106.

Hatt, R.T., J. Van Tyne, L.C. Stuart, C.H. Pope, and A.B. Grobman. 1948. Island Life: A study of the land vertebrates of the islands of eastern Lake Michigan. Cranbrook Inst. of Sci. Bull. no. 27. xi + 179 pp.

Hickey, J.J. (Ed.). 1969. Peregrine falcon populations: Their biology and decline. U. of Wisconsin Press, Madison. 596 pp.

Hough, J.L. 1958. Geology of the Great Lakes. U. of Illinois Press, Urbana. 313 pp.

Hughes, J.D., J.P. Farrell, and E.C. Monahan. 1970. Drift-bottle study of the surface currents of Lake Superior. Mich. Acad. 2(4):25-31.

Ilnicky, N.J. Birds of Marquette County, Michigan. 2732 Werner, Marquette, Michigan. Unpublished manuscript.

Jackson, H.H.T. 1919. An apparent effect of winter inactivity upon distribution of mammals. J. Mammal. 1(1): 58-64.

Johnsson, R.G., and P.C. Shelton. 1965. The vertebrates of Isle Royale National Park. Isle Royale Natural History Association. 21 pp.

Laundre, J.W. 1975. An ecological survey of the mammals of the Huron Mountain area. Huron Mountain Wildl. Foundation Occas. Paper no. 2.

Lennartson. 1972. Huron Islands National Wildlife Refuge, Marquette County, Michigan. Unpublished report, Seney Nat. Wildl. Refuge. 5 pp.

Manville, R.H. 1942. A report on wildlife studies at the Huron Mountain Club, 1939 to 1942. Huron Mountain Club, Big Bay, Michigan. 165 pp.

———. 1948. The vertebrate fauna of the Huron Mountains, Michigan. Amer. Midl. Natur. 39(3):615-640.

———. 1949. A study of small mammal populations in Northern Michigan. Misc. Publ. Mus. Zool., Univ. of Mich. (University of Michigan Press, Ann Arbor) no. 73. 83 pp.

———. 1951. A small island community in midsummer. Ecology 32(4):608-617.

Mech, L.D. 1966. The wolves of Isle Royale. U.S. Nat. Park Serv. Fauna Ser. 7. 210 pp.

Miller, D.H., and L.L. Getz. 1973. Factors influencing the distribution of the redback vole, Clethrionomys gapperi, in New England. II. Vegetation cover, soil moisture, and debris cover. U. of Conn. Occas. Papers, Biol. Sci. Series 2(11):158-180.

Mining Journal, The. 1975. Residents protest area lighthouse closing. Marquette, Michigan. 17 March. n.p.

Morris, R.D. 1969. Competitive exclusion between Microtus and Clethrionomys in the aspen parkland of Saskatchewan. J. Mammal. 50(2):291-301.

McPherson, A.B., and J.N. Krull. 1972. Island populations of small mammals and their affinities with vegetation type, island size, and distance from mainland. Amer. Midl. Natur. 88(2):384-392.

Nichols, G.E., and R.C. Stones. 1971. Occurrences of red bats near and on Isle Royale in Michigan. Jack Pine Warbler 49(4):130.

Olson, S.T., and W.H. Marshall. 1952. The common loon in Minnesota. Occ. Papers of Minn. Mus. of Nat. Hist. no. 5. U. of Minn. Press, Minneapolis. 77 pp.

Overton, W.S. 1971. Estimating the numbers of animals in wildlife populations In Robert H. Giles, Jr. (ed.). Wildlife Management Techniques. The Wildlife Society, Washington, D.C. pp. 403-456.

Ozoga, J.J., and E.M. Harger. 1966. Winter activities and feeding habits of Northern Michigan coyotes. J. Wildl. Manage. 30(4):809-818.

Ozoga, J.J., and C.J. Phillips. 1964. Mammals of Beaver Island, Lake Michigan. Publ. Mus. M.S.U. Biol. Ser. 2(6):307-347.

Ozoga, J.J., and L.J. Verme. 1968. Small mammals of conifer swamp deeryards in Northern Michigan. Pap. Mich. Acad. Sci., Arts, and Letters 53:37-49.

Pough, R.H. 1949. The Audubon land bird guide. Doubleday and Company, Inc., Garden City. 312 pp.

———. 1951. The Audubon water bird guide. Doubleday and Company, Inc., Garden City. 352 pp.

Rice, R.A. 1973. Huron Mountain Birds. Unpublished manuscript, Huron Mountain Club, Big Bay, Michigan. 22 pp.

Robinson, W.L. 1973. McCormick Forest Wildlife: Here today and here tomorrow? Naturalist 24(1):12-19.

———. 1975. Land vertebrates of the McCormick Forest: Part I. Birds and mammals. U.S. Dept. Agr. Forest Service Research Paper. North Central Forest Experiment Station, St. Paul. In press.

Shiras, G., III. 1935. Hunting wild life with camera and flashlight. Vol. I. Lake Superior region. National Geographic Society, Washington, D.C. 450 pp.

Stadnyk, L., R.L. Verch, and B.A. Goetz. 1974. Stockton Island Survey. Northland College, Ashland, Wisconsin. 71 pp.

Stickel, L.F. 1948. The trap line as a measure of small mammal populations. J. Wildl. Mgmt. 12:153-161.

U.S. Dept. Agr. Bureau of Sport Fisheries and Wildlife. No date. Huron Islands and Seney Wilderness study areas. Leaflet. 8 pp.

U.S. Dept. Int. Forest Service, Eastern Region. 1974. Bald Eagle - Osprey status report. Loose leaf. n.p.

Van Tyne, J. 1948. The birds. In Robert T. Hatt, et al., Island Life: A study of the land vertebrates of the islands of eastern Lake Michigan. Cranbrook Inst. of Sci. Bull. no. 27. pp. 69-114.

Wallace, A.R. 1895. Island Life: The phenomena and causes of insular faunas and floras. MacMillan and Co., London. 563 pp.

Webb, W.L. 1965. Small mammal populations on islands. Ecology 46(4):479-488.

Werner, J.K. 1973. The reptiles and amphibians of the McCormick Forest. Naturalist 24(1):21-27.

———. 1975. Land vertebrates of the McCormick Forest: Part II. Amphibians and reptiles. U.S. Dept. Agr. Forest Service Research Paper. North Central Forest Experiment Station, St. Paul. In press.

Werner, W.E., Jr. 1956. Mammals of the Thousand Islands region, New York. J. Mammal. 37(3):395-406.

APPENDIX A

Frequencies of occurrence of ground vegetation within 3 feet and trees within 10 feet of traps at trapping plots on the Huron Islands, Marquette County, Michigan.

Species	Frequency
HURON ISLAND	
Damp grass-rock plot, 12 traps	
Grasses (Graminae)	1.00
Common Yarrow (Achillea Millefolium)	.58
Raspberry (Rubus sp.)	.50
Common Strawberry (Fragaria virginiana)	.33
Common Dandelion (Taraxacum officinale)	.25
Mosses (Musci)	.17
Balsam Fir sapling (Abies balsamea)	.17
Red-osier Dogwood (Cornus stolonifera)	.17
Pin Cherry (Prunus pensylvanica)	.17
Sphagnum	.08
Field Horsetail (Equisetum arvense)	.08
American Yew (Taxus canadensis)	.08
Sedges (Cyperaceae)	.08
Blue-eyed Grass (Sisyrinchium mucronatum)	.08
Blue Flag (Iris versicolor)	.08
Paper Birch (Betula papyrifera)	.08
Lyre-leaved Rock Cress (Arabis lyrata)	.08
Gooseberry (Ribes sp.)	.08
Rose (Rosa spp.)	.08
Chokecherry (Prunus virginiana)	.08
White Violet (Viola blanda)	.08
Bunchberry (Cornus canadensis)	.08
Bearberry (Arctostaphylos Uva-ursi)	.08
Low Blueberry (Vaccinium angustifolium)	.08
Bush Honeysuckle (Diervilla Lonicera)	.08
Goldenrod (Solidago sp.)	.08
Big-leaf Aster (Aster macrophyllus)	.08
Devil's Paintbrush (Hieracium aurantiacum)	.08
Dry grass-rock plot, 3 traps	
Grasses	1.00
St. John's-wort (Hypericum sp.)	.67
Common Strawberry	.33
Raspberry	.33
Common Yarrow	.33

Species	Frequency
Grassy plot, 2 traps	
Grasses	1.00
St. John's-wort	1.00
Serviceberry tree (*Amelanchier* sp.)	.50
Common Strawberry	.50
Chokecherry	.50
Bush Honeysuckle	.50
Goldenrod	.50
Grassy-shady plot, 7 traps	
Grasses	1.00
Balsam Fir tree	.43
Raspberry	.43
Heart-leaved Aster (*Aster cordifolius*)	.43
Day Lily (*Hemerocallis fulva*)	.14
Quaking Aspen tree (*Populus tremuloides*)	.14
Rose	.14
Pin Cherry	.14
Chokecherry	.14
St. John's-wort	.14
Grass-balsam fir plot, 4 traps	
Grasses	.75
Balsam Fir tree	.75
Raspberry	.50
Wild Sarsaparilla (*Aralia nudicaulis*)	.50
American Yew	.25
Mountain Maple sapling (*Acer spicatum*)	.25
Red-osier Dogwood	.25
Twinflower (*Linnaea borealis*)	.25
Open shrub-rock, 8 traps	
American Yew	.88
Lichens	.75
Grasses	.75
Balsam Fir tree	.50
Bearberry	.38
Bracken (*Pteridium aquilinium*)	.25
Canada Mayflower (*Maianthemum canadense*)	.25
Low Blueberry	.25
Bush Honeysuckle	.25
Quaking Aspen sapling	.13
Gooseberry	.13
Mountain Ash tree (*Pyrus americana*)	.13
Chokecherry	.13

Species	Frequency
Pin Cherry	.13
Common Yarrow	.13
Chokecherry shrub plot, 5 traps	
Grasses	1.00
Chokecherry shrubs	.80
Reindeer Lichen (*Cladonia* spp.)	.20
Mosses	.20
Canada Mayflower	.20
Quaking Aspen tree	.20
Quaking Aspen seedlings	.20
Serviceberry	.20
Big-leaf Aster	.20
Red-osier dogwood plot, 5 traps	
Red-osier Dogwood	1.00
American Yew	.80
Balsam Fir tree	.40
Balsam Fir sapling	.40
Grasses	.40
Gooseberry	.40
Bracken	.20
Raspberry	.20
Bush Honeysuckle	.20
Big-leaf Aster	.20
Hawkweed (*Hieracium* sp.)	.20
White pine plot, 6 traps	
White Pine (*Pinus Strobus*)	.50
Balsam Fir seedlings	.50
Lichen	.33
Twinflower	.33
American Yew	.17
Canada Mayflower	.17
Heart-leaved Aster	.17
Balsam fir-yew plot, 6 traps	
Balsam Fir trees	1.00
Mosses	.67
American Yew	.50
Wild Saraaparilla	.50
Canada Mayflower	.33
Twinflower	.17

Species	Frequency
Balsam fir-lichen plot, 5 traps	
Reindeer Lichen	1.00
Balsam Fir trees	1.00
Mosses	.80
Twinflower	.80
Canada Mayflower	.60
Low Blueberry	.60
Bunchberry	.40
Heart-leaved Aster	.40
Common Polypody (Polypodium vulgare)	.20
Grasses	.20
Goldthread (Coptis groenlandicus)	.20
Yew-balsam fir-swamp plot, 14 traps	
American Yew	.71
Spinulose Woodfern (Dryopteris spinulosa)	.57
Balsam Fir trees	.50
Red-osier Dogwood	.50
Sphagnum	.50
Grasses	.43
Thimbleberry (Rubus parviflorus)	.29
Mosses	.21
Paper Birch trees	.14
Wild Sarsaparilla	.14
Big-leaf Aster	.14
Wolf's-claw Clubmoss (Lycopodium clavatum)	.07
Sedges	.07
Clintonia (Clintonia borealis)	.07
Round-lobed Hepatica (Hepatica americana)	.07
Bunchberry	.07
EAST HURON ISLAND	
Grass-shrub plot, 4 traps	
Grasses	1.00
Ninebark (Physocarpus opulifolius)	1.00
Cow Parsnip (Heracleum maximum)	.50
Red-osier Dogwood	.50
Pearly Everlasting (Anaphalis margaritaceae)	.50
Hawkweed	.50
American Yew	.25
Thimbleberry	.25
Chokecherry	.25
Bedstraw (Galium sp.)	.25

Species	Frequency
Open shrub-rock plot, 8 traps	
Balsam Fir saplings	.75
Lichens	.62
Red Pine (*Pinus resinosa*)	.50
Bearberry	.50
Grasses	.37
Low Blueberry	.37
Raspberry	.25
Common Juniper (*Juniperus communis*)	.13
Northern Red Oak (*Quercus rubra borealis*)	.13
Ninebark	.13
Bush Honeysuckle	.13
Balsam fir-no ground cover plot, 8 traps	
Balsam Fir	1.00
Mosses	.80
Black spruce-balsam fir-rock plot, 12 traps	
Lichens	.67
Low Blueberry	.67
Balsam Fir trees	.42
Black Spruce (*Picea mariana*)	.42
Mosses	.42
Red Pine	.25
Labrador Tea (*Ledum groenlandicum*)	.17
Reindeer Lichen	.08
Sphagnum	.08
Bracken	.08
Twinflower	.08
Yew-balsam fir-Michigan holly plot, 7 traps	
American Yew	.86
Balsam Fir trees	.86
Mosses	.57
Michigan Holly (*Ilex verticillata*)	.43
Sphagnum	.29
Twinflower	.29
Mushrooms	.14
Bracken	.14
Grasses	.14
Red Maple tree (*Acer rubrum*)	.14

APPENDIX B

Following is a list of vegetation identified on the Huron Islands, Marquette County, Michigan, during June and July, 1974. Some plants have been grouped into families or genera when further identification was not possible. Scientific nomenclature follows Gray's Manual of Botany, Eighth Edition (Fernald, 1950).

Huron Island	East Huron Island	Scientific Name	Common Name
		EQUISETACEAE	
X	X	Equisetum arvense	Field Horsetail
		LYCOPODIACEAE	
X		Lycopodium lucidulum	Shining Clubmoss
	X	L. annotinum	Stiff Clubmoss
X	X	L. clavatum	Wolf's-claw Clubmoss
X	X	L. obscurum	Princess Pine
		OSMUNDACEAE	
	X	Osmunda regalis	Royal Fern
	X	O. Claytonia	Interrupted Fern
		POLYPODIACEAE	
X	X	Woodsia ilvensis	Rusty Woodsia
X		Cystopteris fragilis	Fragile Fern
	X	Onoclea sensibilis	Sensitive Fern
	X	Dryopteris Thelypteris	Marsh Fern
X		D. simulata	Massachusetts Fern
	X	D. Phegopteris	Long Beech Fern
X	X	D. spinulosa	Spinulose Woodfern
	X	D. cristata	Crested Fern
X	X	D. Filix-mas	Male Fern
X	X	D. marginalis	Marginal Woodfern
	X	Athyrium Filix-femina	Lady Fern
X	X	Pteridium aquilinium	Bracken
X	X	Polypodium vulgare	Common Polypody
		TAXACEAE	
X	X	Taxus canadensis	American Yew

Huron Island	East Huron Island	Scientific Name	Common Name
		PINACEAE	
X	X	Abies balsamea	Balsam Fir
	X	Picea mariana	Black Spruce
X	X	Pinus strobus	White Pine
	X	P. resinosa	Red Pine
		CUPRESSACEAE	
X	X	Thuja occidentalis	Northern White-cedar
X	X	Juniperus communis	Common Juniper
X	X	GRAMINAE spp.	
X	X	CYPERACEAE spp.	
	X	Eriophorum sp.	Cottongrass
		LILIACEAE	
X		Hemerocallis fulva	Day-lily
X		Clintonia borealis	Corn-lily
X	X	Maianthemum canadense	Canada Mayflower
X	X	Polygonatum biflorum	Two-flowered Solomon's-seal
		IRIDACEAE	
X		Sisyrinchium mucronatum	Blue-eyed Grass
x	X	Iris versicolor	Blue Flag
		ORCHIDACEAE	
X	X	Cypripedium acaule	Pink Lady's-slipper
	X	Corallorhiza maculata	Spotted Coralroot
		SALICACEAE	
	X	Salix spp.	Pussy or Bebb Willows
X	X	Populus tremuloides	Quaking Aspen
X		P. balsamifera	Balsam-poplar
		MYRICACEAE	
	X	Myrica Gale	Sweet Gale
		CORYLACEAE	
X	X	Betula lutea	Yellow Birch
X	X	B. papyrifera	Paper (White) Birch
X		Alnus rugosa	Speckled Alder

Huron Island	East Huron Island	Scientific Name	Common Name
		FAGACEAE	
	X	Quercus rubra var. borealis	Northern Red Oak
		POLYGONACEAE	
X		Rumex acetosella	Sheep Sorrel
X	X	Polygonum scandens	Climbing False Buckwheat
		CARYOPHYLLACEAE	
X		Arenaria sp.	Sandwort
		RANUNCULACEAE	
X		Ranunculus acris	Tall Buttercup
X	X	Thalictrum dasycarpum	Purple Meadow-rue
X		Hepatica americana	Round-lobed Hepatica
X		Coptis groenlandica	Goldthread
X	X	Aquilegia canadensis	Wild Columbine
		PAPAVERACEAE	
X	X	Corydalis sempervirens	Pale Corydalis
		CRUCIFERAE	
X		Draba sp.	
X	X	Arabis lyrata	Lyre-leaved Rockcress
		DROSERACEAE	
X		Drosera rotundifolia	Round-leaved Sundew
		SAXIFRAGACEAE	
X		Saxifraga virginiensis	Early Saxifrage
X	X	Ribes sp.	Gooseberry
		ROSACEAE	
	X	Physocarpus opulifolius	Ninebark
X	X	Pyrus (=Sorbus) americana	Mountain-ash
X	X	Amelanchier sp.	Serviceberry
X		Fragaria virginiana	Common Strawberry
X	X	Potentilla tridentata	Three-toothed Cinquefoil

Huron Island	East Huron Island	Scientific Name	Common Name
X	X	Potentilla arguta	Tall Cinquefoil
X		Rubus sp.	Raspberry
X	X	Rubus parviflorus	Thimbleberry
X	X	Rosa spp.	3 species
X	X	Prunus pensylvanica	Pin Cherry
X	X	P. virginiana	Common Chokecherry
		GERANIACEAE	
X	X	Geranium Bicknellii	Bicknell's Cranesbill
		AQUIFOLIACEAE	
	X	Ilex verticillata	Michigan Holly
		ACERACEAE	
X	X	Acer spicatum	Mountain Maple
X	X	A. saccharum	Sugar Maple
X	X	A. rubrum	Red Maple
		GUTTIFERAE	
X		Hypericum sp.	St. John's-wort
		VIOLACEAE	
X	X	Viola blanda	Sweet White Violet
X	X	V. adunca	Hooked-spur Violet
		ONAGRACEAE	
	X	Epilobium angustifolium	Fireweed
		ARALIACEAE	
X	X	Aralia nudicaulis	Wild Sarsaparilla
		UMBELLIFERAE	
X	X	Heracleum maximum	Cow Parsnip
		CORNACEAE	
X	X	Cornus canadensis	Bunchberry
X	X	C. stolonifera	Red-osier Dogwood
		PYROLACEAE	
	X	Moneses uniflora	One-flowered Winter-green

Huron Island	East Huron Island	Scientific Name	Common Name
		ERICACEAE	
	X	*Ledum groenlandicum*	Labrador Tea
X		*Chamaedaphne calyculata*	Leatherleaf
	X	*Epigaea repens*	Trailing Arbutus
	X	*Gaultheria procumbens*	Checkerberry
X	X	*Arctostaphylos Uva-ursi*	Bearberry
X	X	*Gaylussacia baccata*	Black Huckleberry
X	X	*Vaccinium angustifolium*	Low Blueberry
		PRIMULACEAE	
X	X	*Trientalis borealis*	Starflower
		RUBIACEAE	
X	X	*Galium* sp.	Bedstraw
		CAPRIFOLIACEAE	
X	X	*Diervilla Lonicera*	Bush Honeysuckle
	X	*Lonicera villosa*	Mountain Fly-honeysuckle
X		*L. hirsuta*	Hairy Honeysuckle
X	X	*Linnaea borealis*	Twinflower
X		*Sambucus pubens*	Red-berried Elder
		CAMPANULACEAE	
	X	*Campanula rotundifolia*	Harebell
		COMPOSITAE	
X	X	*Solidago* spp.	Goldenrod
X	X	*Aster cordifolius*	Heart-leaved Aster
X		*A. macrophyllus*	Large-leaved Aster
	X	*A. junciformis*	Rush Aster
X	X	*Anaphalis margaritacea*	Pearly Everlasting
X		*Antennaria neglecta*	Field Pussytoes
X		*Achillea Millefolium*	Common Yarrow
X	X	*Chrysanthemum leucanthemum*	Ox-eye Daisy
X		*Taraxacum officinale*	Common Dandelion
X	X	*Prenanthes* sp.	Rattlesnake-root
X	X	*Hieracium* sp.	Hawkweed
X	X	*H. aurantiacum*	Devil's Paintbrush